Elizabeth City State University

ONR-AASERT

Summer 1995 Research Teams

Dr. Linda Bailey Hayden, Principal Investigator

Computer Visualization and Virtual Reality Team
Dr. Jingyuan Zhang, Mentor
Tammara Ward, Sophomore-Math
Je'aime Powell, Precollege
Tanisha Cowell, Sophomore-CS
Melvin Anderson, Sophomore-CS

Object Oriented Programming Team
Dr. Larry Morrel, Mentor
Makeba Fussell, Senior-CS
Rosa Riddick, Senior-CS
Timothy McCray, Graduate Student-CS
Michelle Brown, Graudate Student-CS
Matresha Walker, Senior-CS
Reginald Turner, Senior-CS

Multimedia Authoring Team
Mr. Derrick L. Wilkins, Mentor
Derrek Burrus, Freshman- CS
Lakesha Mundon, Freshman-Math
Courtney Fields, Freshman-CS
Connie Sawyer, Precollege

ATM Networking Team
Dr. Linda Hayden, Mentor
Sharon Saunders, Graduate Student-CS
Kevin Trotman, Graduate Student-CS
Kuchumbi Hayden, Freshman-CS
Curtis Felton, Sophomore - CS/Chem
Denisa Edwards, Graduate Student-CS

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Dr. Linda B. Hayden

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Elizabeth City State University
1704 Weeksville Road Box 672
Elizabeth City NC 27909

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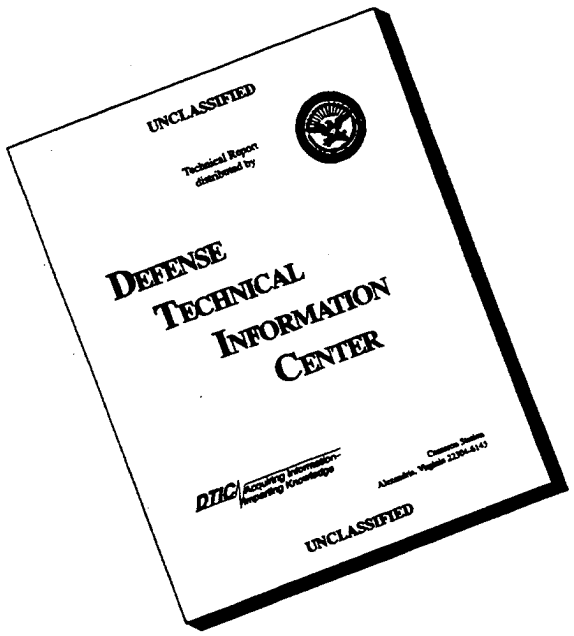

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Table of Contents

ONR-AASERT Summer'95 Research Project
Dr. Linda Hayden, Principal Investigator

This ONR-AASERT research project, at ECSU, supports undergraduates and precollege students in our summer research training. All Students hired under this research project investigate one or two computer science subareas. The subareas of their research investigations are: **Multimedia media authoring & object oriented programming (MMA-OOPs); virtual reality & computer graphics (VR-GRAPHICS); and computer visualization & networking (CV-NET). Each will also be assigned a computer networking/INTERNET problem to investigate.**

Undergraduate Computer Science majors must be full time ECSU students with a minimum 2.8 overall GPA, 3.0 GPA in their major courses and must be recommended by two of their major professors. The undergraduates will work in the laboratory for 5 hours each day, 5 days each week for 6 weeks.

Precollege students selected have completed a minimum of three credits of mathematics including geometry and algebra II. Grades of B or better in these courses plus recommendation of two science/mathematics teachers will be required. The precollege students will work in the laboratory for five weeks, 5 hours each day, 5 days each week. All students, both precollege and undergraduate must be citizens of the United States.

The Instructor for each team will be a member of the ECSU faculty/staff who is knowledgeable in the subdiscipline. Instructors will work with the students for approximately 3 hours each day, 4 days each week.

Consultants are available to team members daily via email and will make extended visits to the ECSU site.

Assistant Instructors are graduate students pursuing a Masters or PH.D. in Computer Science. Assistant Instructors will work with the students 5 hours each day.

Planned Activities

Lectures by visiting consultants	Final Research Project Reports
Weekly Progress Reports	SIGGRAPH Conference
Product Demonstrations	Visiting Lecture
Staff Tour	

Schedule

June 26-29	Pre-program training activities
June 28	Research teams begin
July 27	Apple Representatives Demonstration
Aug. 1-4	Navy's Educators Tour (staff only)
Aug. 5	Final Reports
Aug. 5-10	SIGGRAPH'95
June 26-Aug 3	Visiting Lecture By Dr. Morrell Professor of CS at Hampton

SIGGRAPH is the world's largest, most prestigious conference on computer graphic and interactive techniques. It is a powerful interactive media adventure. There students will meet and exchange ideas with people who envision, explore, imagine and define the magic of real-time global collaborations. The exhibits will show all the leading suppliers of hardware, software and services that empower the digital revolution. We will attend the conference in August when science, digital media, human interaction, entertainment and networked environments converge to create SIGGRAPH95

Research Project Descriptions

1. MULTIMEDIA AUTHORING & OBJECT ORIENTED PROGRAMMING (MMA-OOPs)

OOPs-Student Researchers will investigate object oriented programming models. They will research languages and hardware necessary to support OOPs. They will implement assigned OOPs programs in C++ Language by Borland. Literature reviews will focus on the current applications of OOPs and the future of OOPs.

Team Members(4): Michelle Brown, Timothy McCray, Makeba Fussell, Rosa Riddick

MMA-Student Researchers will learn to use the normal output media of display screen and printed hard copy along with recorded high-quality audio, high-quality still images, animation, and recorded motion video. Multimedia elements such as images, audio and animation will be collected and created. Students will program the output and build the sequences which dictate program behavior. All major steps in a typical authoring project will be included in the final project: Concept, Design, Obtaining content material, Assembly, Testing, and Distribution will be explored. Reference material will include *Authoring Interactive Multimedia by Arch C. Luther, AP Professional Publishers 1994, ISBN 0-12-460430-7*

Team Members(6): Connie Sawyer, Courtney Fields, LaKeshia Mundon, Matresha Walker, Derrek Burrus

2. VIRTUAL REALITY & COMPUTER GRAPHICS (VR-GRAPHICS)

GRAPHICS-The students will define scenes using the tools they build, and describe the surface details like shading and texturing using RenderMan's Shader Language. They will also put different kinds of light sources into the scenes. Finally, they will develop frames for animation by either moving part of the scene or moving the camera, and putting these frames together for playing. Students will implement projects on the sun sparc workstations. Visiting Lectures will be from representatives of Sonalysts, Inc. Multimedia Authoring and Virtual Reality Specialist. The literature review will include chapters from Renderman Companion by Steve Upstill, Addison Publishers, 1992 ISBN 0-201-508680.

VR--- Students will use 3D drawing and visualization programs for the Power Macs 8100 which include realtime texture mapping. Students create and explore 3D multimedia virtual environment with support for PICT images, Quicktime movies, and VDIG video as textures.

Team Members(4): Je'aime Powell, Melvin Anderson, Tammara Ward, Tanisha Cowell

3. COMPUTER VISUALIZATION & NETWORKING (CV-NET)

NET- The focus of the Networking Research will be on Issues, challenges and Installation of Asynchronous transfer mode (ATM) networks. Student researchers get hands on experience while assisting with the installation of ATM Network in Lester Hall. Visiting Lecture will be presented by the Professional networking team from ADNET Systems, Inc. Review of the literature will include articles from the Communications of the ACM, Feb. 1995, Vol. 38, no. 2, p 28-109.

CV-The focus of the computer visualization research will be use of data explorer visualization software running on a silicone graphics workstation. Students will run visualizations on chemistry data sets. Visiting Lecture will be presented by Sharon Ramsey, visualization specialist from Alcoa Aluminum Co. Review of the literature will include chapters from Animation and Scientific Visualization: Tools & Applications, Edited by R A Earnshaw and D. Watson, Academic Press, 1993. ISBN 0-12-227745-7. References will also include Communications of the ACM Dec'94, vol. 37, no 12 p 29-102.

Team Members(5): Kevin Trotman, Sharon Saunders, Kuchumbi Hayden, Denisa Edwards, Curtis Felton

		Pre-Program AASERT Summer Research Program					
Name	Internet Training	Hackers Video	SunTutor	MacBasics & Microsoft Works	Windows Tutor	Vi Editor	
Anderson, Melvin	Trainee	Instructor	Trainee	Trainee	Trainee	Trainee	
Brown, Michelle	Trainee	Exempt	Trainee	Exempt	Exempt	Trainee	
Burus, Derrek	Trainee	Instructor	Trainee	Instructor	Trainee	Trainee	
Cowell, Tanisha	Trainee	Trainee	Trainee	Trainee	Trainee	Trainee	
Edwards, Denisa	Trainee	Trainee	Trainee	Instructor	Trainee	Trainee	
Felton, Curtis	Instructor	Exempt	Instructor	Exempt	Trainee	Instructor	
Fields, Courtney	Trainee	Trainee	Trainee	Trainee	Trainee	Trainee	
Fussell, Makeba	Trainee	Trainee	Instructor	Exempt	Exempt	Exempt	
Hayden, Kuchumbi	Instructor	Exempt	Instructor	Exempt	Trainee	Instructor	
McCray, Timothy	Trainee	Exempt	Trainee	Exempt	Instructor	Trainee	
Mundon, Lakesha	Trainee	Trainee	Trainee	Trainee	Trainee	Trainee	
Powell, Je'aime	Instructor	Exempt	Trainee	Instructor	Trainee	Trainee	
Riddick, Rosa	Trainee	Trainee	Instructor	Exempt	Instructor	Instructor	
Saunders, Sharon	Instructor	Exempt	Exempt	Exempt	Exempt	Instructor	
Sawyer, Connie III	Trainee	Instructor	Trainee	Instructor	Trainee	Trainee	
Trotman, Kevin	Instructor	Exempt	Exempt	Exempt	Exempt	Instructor	
Walker, Matresha	Instructor	Exempt	Trainee	Exempt	Trainee	Trainee	
Ward, Tammara	Trainee	Exempt	Trainee	Instructor	Instructor	Trainee	
Note:	1) Exempt means that you may still be called on to be an instructor or to assist with other activites.						
	2) SUNTUTOR and the Hackers Video activity will be held on the first day of the Pre-Program.						
	3) Internet Training, Mac Tutorials will be conducted for 3 hr each day on the second day of the Pre-Program						
	4) Windows Tutor and Vi editor activity will be held on the thrid day of the Pre-Program.						

Elizabeth City State University
ONR- AASERT Undergraduate Research Program

1995 WEEKLY SCHEDULE

Week #1	ACTIVITIES & TIMES
MONDAY	9:30 - 10:00 Opening Meeting 10:00 - 11:00 Hackers Video 11:00 - 12:30 Teams 12:30 - 1:30 LUNCH 1:30 - 4:00 SUNTUTOR
TUESDAY	9:30 - 12:30 INTERNET TRAINING 12:30 - 1:30 LUNCH 1:30 - 4:30 MACINTOSH TUTORIALS
WEDNESDAY	9:30 - 12:30 Vi Editor Instruction 12:30 - 1:30 LUNCH 1:30 - 4:30 Windows Instruction
THURSDAY	9:30 - 12:30 Catch-up day 12:30 - 1:30 LUNCH 1:30 - 3:30 Catch-up day
FRIDAY	9:30 - 12:30 TEAMS 12:30 - 1:30 LUNCH 1:30 - 3:30 TEAMS

Week #2-#5 : See weekly schedule
Week #6 : SIGGRAPH Conference and final written reports

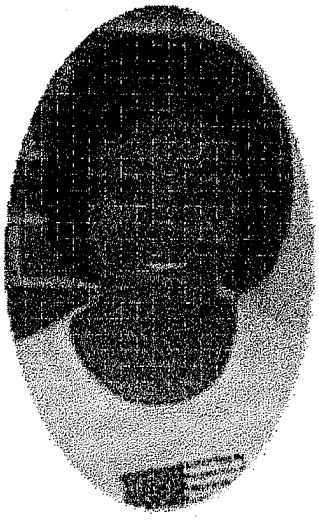
Elizabeth City State University
ONR-AASERT Undergraduate Research Program

1995 Weekly Schedule

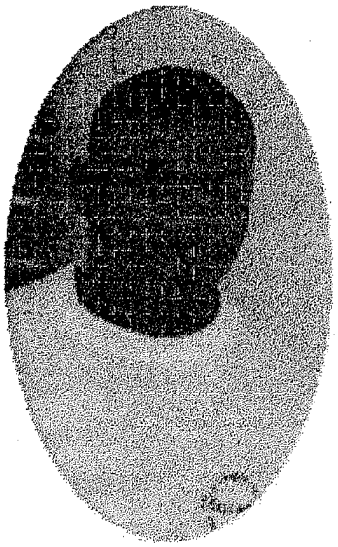
Weeks #2 - #5	Times	Activites
Monday	9:30-12:30	Dr. Morell: OOPS Presentation (wks 1-3) PP Presentations (wks 4-5)
	12:30-1:30	Lunch
	1:30-3:30	Teams
Tuesday	9:30-12:30	Teams
	12:30-1:30	Lunch
	1:30-3:30	Dr. Hayden: Internet/WWW/Unix Labs
Wednesday	9:30-12:30	Dr. Morell: OOPS Labs (wks 1-3) PP Labs (wks 4-5)
	12:30-1:30	Lunch
	1:30-3:30	Teams
Thursday	9:30-12:30	Teams
	12:30-1:30	Lunch
	1:30-3:30	Dr. Zhang: VR Presentations (article reviews, demonstrations and labs)
Friday	9:30-12:30	Teams
	12:30-1:30	Lunch
	1:30-3:30	Reports

Week #1: See preprogram schedule
Week #5: SIGGRAPH Conference and final written reports

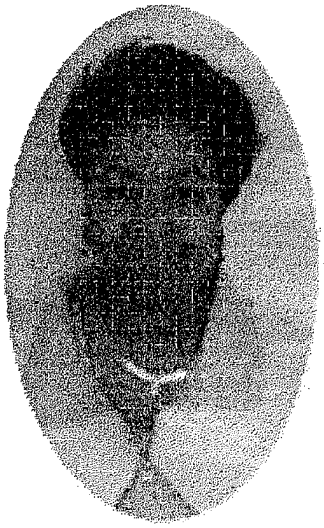
1995 Summer Researchers



Courtney Fields

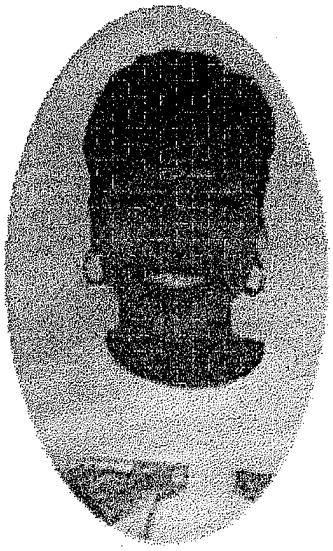


Derrek Burrus



Tammara Ward

Lakesha Mundon



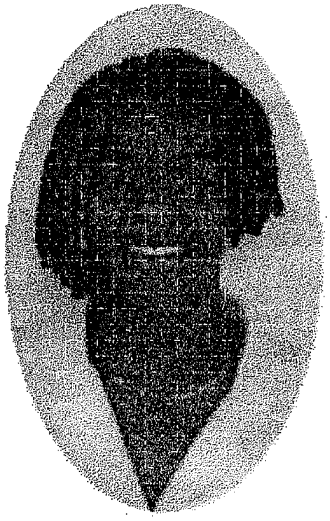
Denisa Edwards

Michelle Brown-Emmanual

1995 Summer Researchers

Sharon Saunders

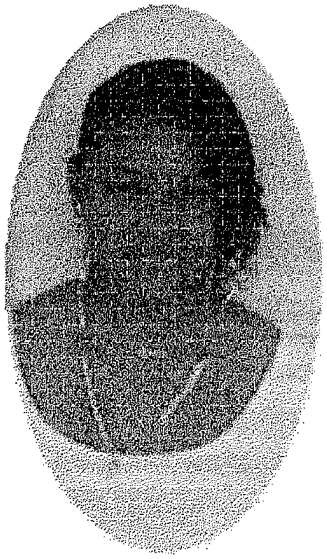
Matresha Walker



Rosa Riddick

Melvin Anderson

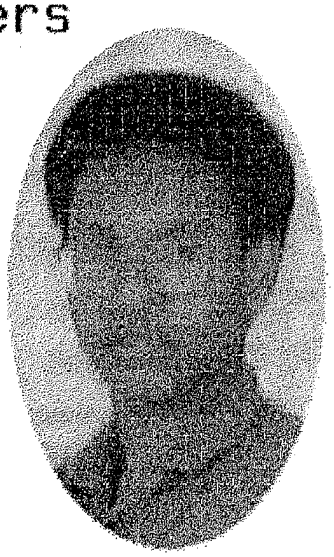
Makeba Fussell



Tanisha Cowell

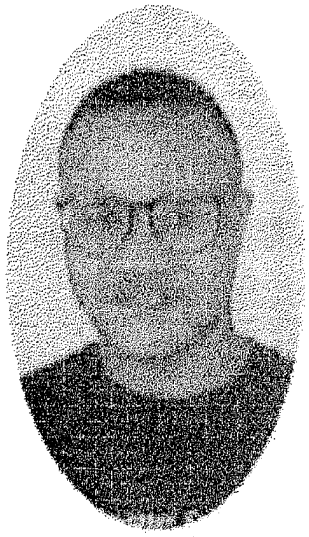
1995 Summer Researchers

Timothy McCray

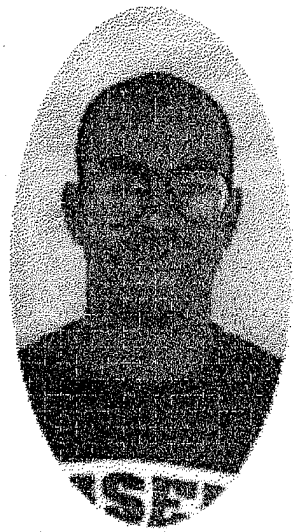


Kuchumbi Hayden

Curtis Felton



Je'aime Powell



Connie Sawyer

Kevin Trotman

CV-Net Research Team

Object Oriented
Programming Research Team

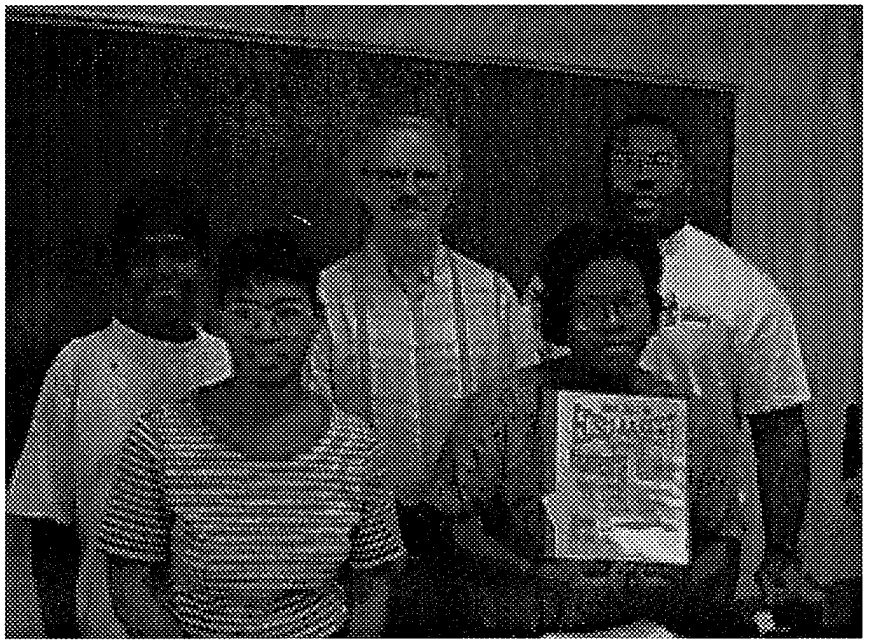
Research Teams
1995

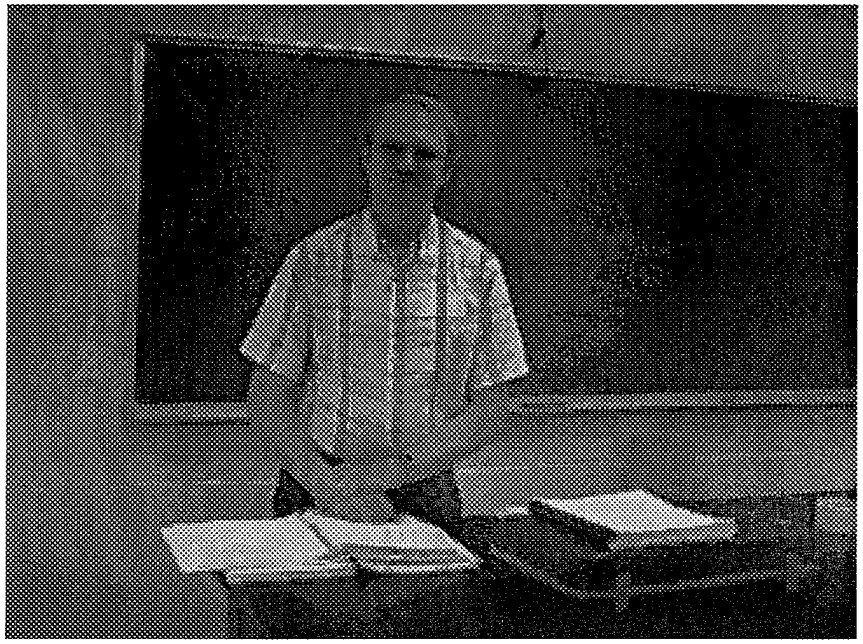
VR-Graphics

Multimedia Research Team

OOPs Team

OOPS
Object Oriented Programming Team





Dr. Larry Morrel, Mentor
Timothy Mc Cray
Makeba Fussell
Rosa Riddick
Michelle Brown-Emmanual
Reginald Turner (not shown)
Matresha Walker (not shown)

ECSU-ASSERT Research Program
The OOPs Group
Report 1, Weeks 1 & 2
"Misplaced Objects"

One of the reasons that so many people are moving to C++ is that so many people already know C. In the past two weeks, our group has discovered the purpose for Object-Oriented programming, and why it is easier, and faster than structured programming. Object-Oriented programming is a natural way of programming. In our research, we have learned that their are vast differences between designing and analyzing structured and unstructured code. Structured code is code that is procedure-oriented. In the program's design, you usually have to detail every step. In Object-Oriented design it is more general. Meaning that instructions are messages, these messages are received by objects, which are classified hiearchally, and the objects included in the program are expected to know how to respond differently to messages. It is important to understand that if any of these characteristics are missing, it is not considered an object-oriented program.

What exactly is an object? An object is a anything that has *identity, state*, and *behavior*. A person could be considered an object. We all have certain characteristics that distinguish us from the person next to us...this is our part of our identity. A person's wealth, health, or marital status could refer to that person's state because the term state refers to all the properties of an object and all the values of each of these properties. Behavior is how a person would act or react in terms of their state and how it changes. Different people (which are the objects) can be grouped into a *class*, which is a set of objects that share a common behavior and a common structure.

In our research thus far, we have found that in order to have an object-oriented model, there are four elements that go into this process . These include *abstraction, encapsulation, Inheritance* and *polymorphism*. Abstraction provides data access and manipulation through a defined interface. It is a way of getting some type of information by using some type of procedure. Encapsulations provides the security for accessing the information. It enforces the use of the standard procedure for obtaining information. One good example that was given during Dr. Morell's presentation was how we access our e-mail accounts by using our log-in names. An example of inheritance could be a father and his son. Even though the son carries some of the same traits, he is still considered a person. It is more than likely, in any given situation, if both are given the same instructions, they will react differently to the instructions, thus demonstrating the concept of polymorphism. We also learned that design can be achieved in three different ways: *Top-Down* design, which is used in structured programming via an algorithm, *Object-Oriented* design, and *Data Driven* design.

Dr. Morell handed out a program written in C++. This program allowed the user to enter the current time and it gave us the time for the next ten minutes. Dr. Morell walked us through this code until it was completely understood. Once we were able to identify the parts of the program (i.e., objects , classes, and attributes) we had to modify the program. The user would be able to input the value of the dollars and cents, the dollars and cents had to be incremented by the use of a loop. He considered this the beginners step. The advanced step, was to increment the amount by 3% or 10%. The OOPs team had to check for validation by comparing the dollars and cents values to see if they where incremented correctly. Our final step to this project involved the use of inheritance in these three programs. We were able to build a project called **digittim.prj** by linking **digittim.cpp**, and **main.cpp**.

Using these three subprograms, we were able to see the design of the objects; which includes *analysis, design, programming* and *testing*. The team was also able to see the use of the objects, and the implementation of the objects.

Now that we are approaching our third week of study, the OOPs group is moving on to such topics as the relationships among classes. These include *Association, Inheritance, Aggregation, Instantiation, Meta class*, and *Using*. Our team is also moving in the direction of different paradigms of object-oriented programming. The OOPs teams final project will consist of creating a calculator by using the techniques of object oriented programming under the direction of Dr. Morell. Hopefully in our next report we will be able to go more in depth on these subjects.

ECSU- ASSERT Research Program
The OOPS Group
Report 2, Week 3
"The object of the matter is...."

When one thinks of inheritance, one usually thinks of characteristics or traits that are derived from other sources. This week the Object-Oriented Programming group begin with the different relationships of classes. The relationship that we discussed this week dealt with inheritance.

What is inheritance? Inheritance is behavior and data associated with child classes that are always an extension of the properties associated with parent classes. A subclass must have all the properties of the parent classes and others as well. For example, a relationship dealing with animals. If class Dog is a subclass of class Mammal and class Mammal is in turn a subclass of class Animal , then Dog will inherit attributes both from Mammal and Animal (Fig.1).

This type of inheritance is prevalent in programming also. By using inheritance, one can save alot of time simply because you are only designing and implementing a new class from an existing or similar class. This class shares as much of the previous definition as possible. The advantages of inheritance are as follows:

Software Reuse

When behavior is inherited from another class, the code that provides that behavior does not have to be rewritten.

Code Sharing

Two or more classes developed by a single programmer as part of a project inherit from a single parent class.

Rapid Prototyping

Ability to combine previously written objects together quickly.

Polymorphism

Permits the programmer to generate reusable components that can be tailored to fit different applications.

Information Hiding

When a software component is reused by a programmer, the programmer needs only to understand the nature of the component and it's interface.

This week Dr. Morell handed out a program called Counter.cc that exhibited these characteristics. In the program, the public section of the class of TwoPartCounter was inherited by the classes Timer and MoneyCtr. For example, the statement "void show" located in the public section of class TwoPartCounter can be accessed by the classes Timer and MoneyCtr. Inheritance makes programming easier because the programmer in this case does not have to redefine anything. This program also used such terms as private, which does not give access to anyone, and protected, which can only be accessed by the class itself, the subclasses, and its friend. In our program, Timer is a friend of TwoPartCounter (Fig. 2).

On Wednesday, July 12, Dr. Morell informed us that in C++ programming it is important to build a project before compilation. A project is the linking of all the .cpp files that are necessary to execute the program. In the structure of a C++ program, there are standard files that need to be included. These are denoted by *#include<filename.h>*. These include files allow you to use commands such as *cin* and *cout*. Once he was sure that we understood, we proceeded to write a program that pushed and popped integers onto and off of a stack. We also checked to see if the stack was empty and to see what integer was on top of the stack. A major difference our team noticed was in the initialization process. When we checked the top of the stack, if it was equal to negative 1, then the stack was empty.

The last part we discussed was the issue of a dispatcher. In programming, the dispatcher receives all jobs that are to be performed and then distributes the appropriate job to the appropriate processor.

This week the OOPs group began the steps involved in object-oriented development. First, we stated our project. Then, we produced a Logical model of our calculator, which defined our classes, subclasses, and their attributes (Fig. 3). Our Physical Model was created to give a general idea of how we would like our Display, Buttons and the Calculator itself to appear to the user (Fig 4).

In our fourth week of research, the OOPs group will be moving on to the implementation of the program. This part or our project will be located in our .cpp file.

Inheritance

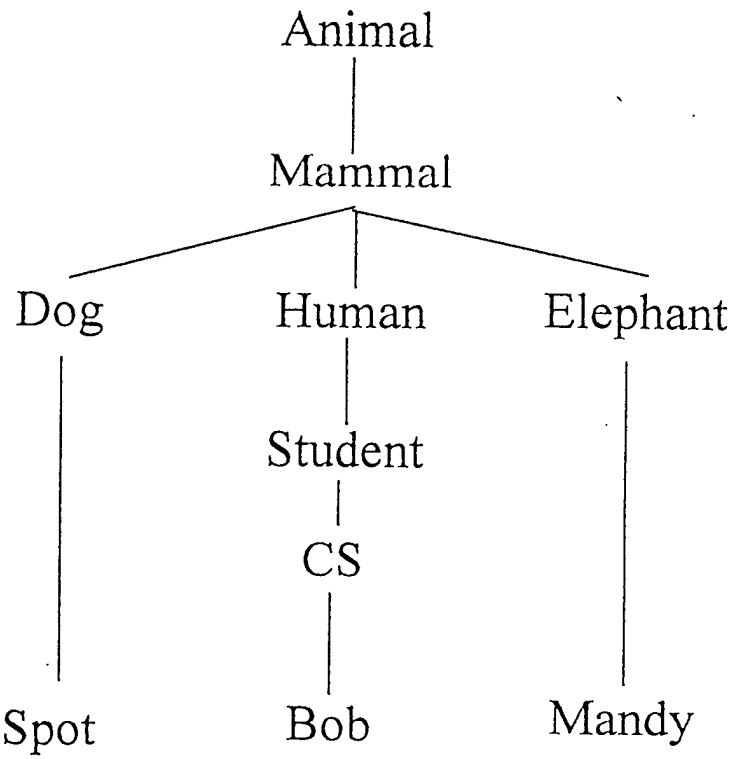


Figure 1

```
//  Taken from the book The Object Concept by Rick Decker
//  and Stuart Hirshfield

// Declarations of classes Display and Timer
class Display // same as before ... omitted
class TwoPartCounter
// A TwoPartCounter object consists of two Displays. When the
// object is incremented its right display is increment, which,
// upon reseting to 0 causes the left display to be incremented.
{
public:
   TwoPartCounter (int l, int r);     // new Counter, set left to l, right to r
   void Increment ();                 // Add  1  to right
   void Increase (int P);             // Increase ctr by P percent
   void Set ();                       // Set left and right
   virtual void Show ();              // Show left and right

protected:                            // protected = allow descendant access
   Display  left,                     // two displays, one for hours
            right;                    // one for minutes

};

class Timer :public TwoPartCounter
// A timer object consists of two Displays, one for hours
// and one for minutes.  When the timer is incremented and
// minutes becomes 60, minutes is reset to 0 and hours is
// incremented.
{
public:
   Timer ();                  // Initialize a new Timer left to 24 right to 60
   void Show ();              // Show hours and minutes

};

class MoneyCtr :public TwoPartCounter
// A MoneyCtr object consists of two Displays, one for dollars
// and one for cents.  When the timer is incremented and
// right display becomes 100, left display is reset to 0 and hours is
// incremented.
{
public:
   MoneyCtr ();     // Initialize, setting left display to 1000, right display to 100
   void Show ();    // Show $xxx.xx
};
```


Fig. 2

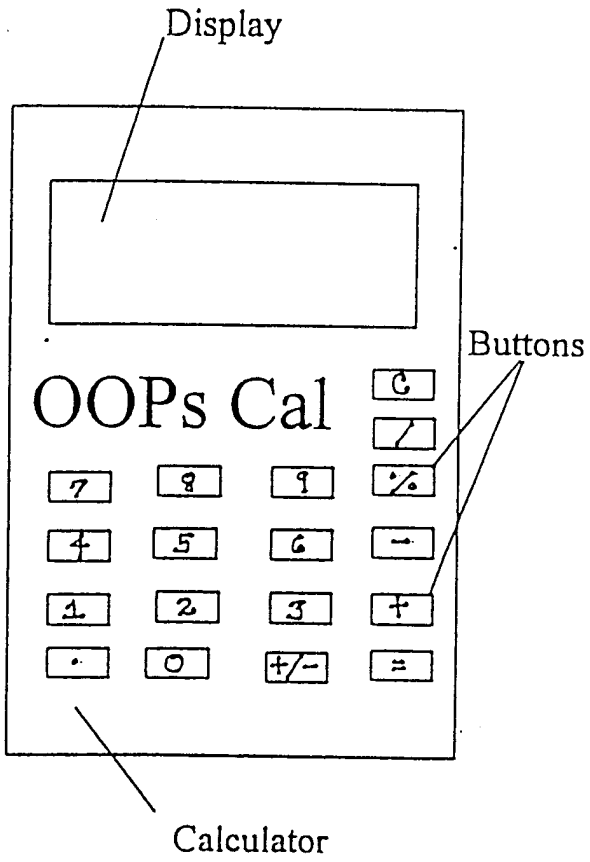

```
//---------------  Counter.cc ------------------
//  Taken from the book The Object Concept by Rick Decker
//  and Stuart Hirshfield.  Additions by Larry Morell.

// Implementation of classes Display, TwoPartCounter and Timer
#include <iostream.h>                  // for cout and cin
#include "Counter.h"                   // for Display and Timer Declarations
// Methods for Display same as before ... omitted

TwoPartCounter::TwoPartCounter(int l, int r): left(l), right(r)
// Initialize a new TwoPartCounter object
// setting max left to 24 and right to 60
( // initialization is done in the heading! )

void TwoPartCounter::Increment ()  // Add  1 to right
{
   right.Increment();
   if (right.GetValue() == 0)     // right counter turned over
      left.Increment();           // so increment the left counter
}

void TwoPartCounter::Increase (int P)  // increase represented values by P percent
{   long total;  int newright, newleft;
    total =left.GetValue()*right.GetLimit() + right.GetValue();
    total = (total * P) / 100 + total;
    newleft = total / right.GetLimit();
    left.SetValue(newleft);  // quotient
    newright = total % right.GetLimit();
    right.SetValue (newright); // remainder
}

void TwoPartCounter::Set ()   // Set left and right
{  int setting;               // user-input values for left/right
   cout << "Set left to what value?\n";
   cout << "Enter an integer between 0 and " << left.GetLimit() << ": ";
   cin >> setting;
   left.SetValue (setting);    // Set left
   cout << "Set right to what value?\n";
   cout << "Enter an integer between 0 and " << right.GetLimit() << ":";
   cin >> setting;
   right.SetValue (setting);    // Set left
}

void TwoPartCounter::Show ()   // Show left and right
{      left.Show();      cout << ':';      right.Show();   }
```


Fig. 2c

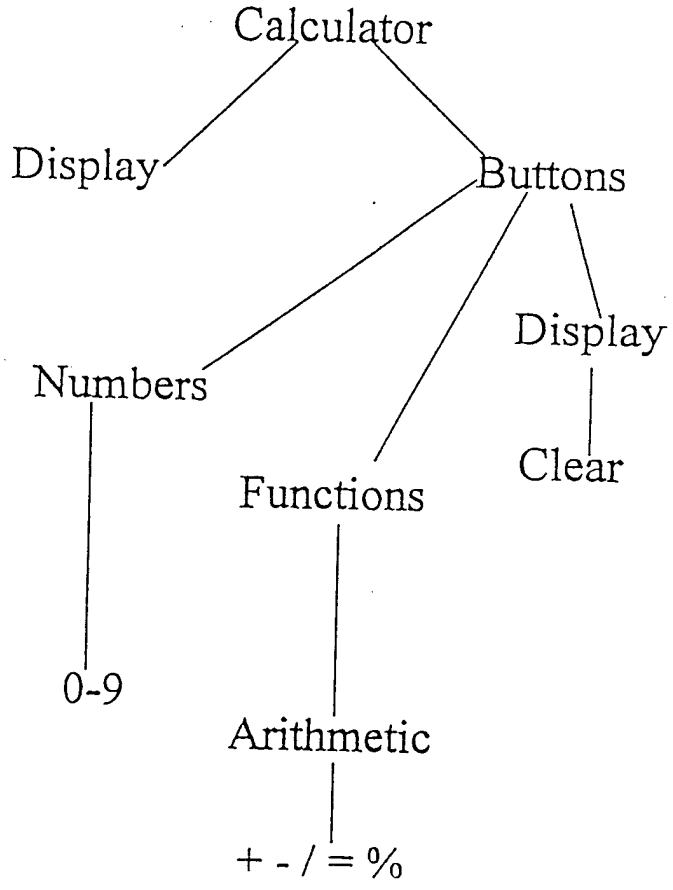
Project Definition

This program is designed to implement and emulate the functions of a calculator that should be able to perform standard arithmetic functions.

Physical Model



Logical Model



OOPS

WEEKLY REPORT

JUNE 26, 1995 - JULY 7, 1995

MICHELLE BROWN
ROSA RIDDICK
MATRESHA WALKER
MAKEBA FUSSELL
TIMOTHY MCCRAY

ECSU-ASSERT Research Program
The OOPs Group
Report 1, Weeks 1 & 2
"Misplaced Objects"

One of the reasons that so many people are moving to C++ is that so many people already know C. In the past two weeks, our group has discovered the purpose for Object-Oriented programming, and why it is easier, and faster than structured programming. Object-Oriented programming is a natural way of programming. In our research, we have learned that their are vast differences between designing and analyzing structured and unstructured code. Structured code is code that is procedure-oriented. In the program's design, you usually have to detail every step. In Object-Oriented design it is more general. Meaning that instructions are messages, these messages are received by objects, which are classified hiearchally, and the objects included in the program are expected to know how to respond differently to messages. It is important to understand that if any of these characteristics are missing, it is not considered an object-oriented program.

What exactly is an object? An object is a anything that has *identity, state*, and *behavior*. A person could be considered an object. We all have certain characteristics that distinguish us from the person next to us...this is our part of our identity. A person's wealth, health, or marital status could refer to that person's state because the term state refers to all the properties of an object and all the values of each of these properties. Behavior is how a person would act or react in terms of their state and how it changes. Different people (which are the objects) can be grouped into a *class*, which is a set of objects that share a common behavior and a common structure.

In our research thus far, we have found that in order to have an object-oriented model, there are four elements that go into this process . These include *abstraction, encapsulation, inheritance* and *polymorphism*. Abstraction provides data access and manipulation through a defined interface. It is a way of getting some type of information by using some type of procedure. Encapsulations provides the security for accessing the information. It enforces the use of the standard procedure for obtaining information. One good example that was given during Dr. Morell's presentation was how we access our e-mail accounts by using our log-in names. An example of inheritance could be a father and his son. Even though the son carries some of the same traits, he is still considered a person which is an object because he still has state and his own behavior. It is more than likely, in any given situation, if both are given the same instructions, they will react differently to the instructions, thus demonstrating the concept of polymorphism. We also learned that program development can be achieved in three different ways: *Top-Down* design, which is used in structured programming via and algorithm, *Object-Oriented* design, and *Data Driven* design.

Dr. Morell handed out a program written in C++. This program allowed the user to enter the current time and it gave us the time for the next ten minutes. Dr. Morell walked us through this code until it was completely understood. Once we were able to identify the parts of the program (i.e., objects, classes and attributes) we had to modify the program. The user would be able to input the value of the dollars and cents, the dollars and cents had to be incremented by the use of a loop. He considered this the beginners step. The advanced step, was to increment the amount by 3% or 10%. The OOPs team had to check for validation by comparing the dollars and cents values to see if they were incremented correctly. Our final step to this project involved the use of inheritance in these three programs. We were able to build a project called digittim.prj by linking digittim.cpp, and main.cpp.

Using these three subprograms, we were able to see the design of the objects; which includes *analysis, design, programming* and *testing*. The team was also able to see the use of the objects, and the implementation of the objects.

- Now that we are approaching our third week of study, the OOPs group is moving on to topics such as the relationships among classes. These include Association, Inheritance, Aggregation, Instantiation, Meta class, and Using. Our team is also moving in the direction of different paradigms of object-oriented programming. The Opps teams final project will consist of creating a calculator by using the techniques of object- oriented programming under the direction of Dr. Morell. Hopefully in our next report we will be able to go more in depth on these subjects.

```
// ---------------  Main.cc  ---------------

#include <iostream.h>                    //for cout, cin
#include "digittim.h"                   //for Timer and Display

void main ()
{
  Timer t;   // Create and initialize a timer object named "T"

  cout << "Here's the initial value of the timer: ";
  t.Show();
  cout << "\n\n";

  t.Set();      // Allow the user to set the timer's value
  cout << "Here are the new settings: ";
  t.Show();
  cout << "\n\n";

  cout << "Now were run for 10 minutes ... \n";

  for (int i = 0; i < 10;  i = i + 1)
  {
     t.Increment();
     t.Show();
     cout << "\n";
  }

  // Freeze the screen until the user presses a key
  cout << "\nPress a key followed by Enter to terminate ...";
  char any;
  cin >> any;
  cout << "\n Processing completed ... Good bye!\n";

}
```

```
// Implementation of classes Display and Timer
#include <iostream.h>                    // for cout and cin
#include "digittim.h"                    // for Display and Timer Declarations


 Display::Display (int lim)
 // Initialize a new Display object
 {
    value = 0;
    limit = lim;
 }
 void Display::Increment ()
 // Add 1 to value
 {
    value = value + 1;
    if (value == limit)
       value = 0;
 }
 void Display::SetValue (int val)
 // Set the value
 {
    if (val < 0)
       val = -val;
    value = val % limit;
 }
 int Display::GetValue ()
 // Return the current value
 {
    return value;
 }
 void Display::Show ()
 // Show the current value
 {
    if (value < 10)
       cout << '0';
    cout << value;
 }
 int Display::GetLimit ()
 // Return the limit
 {
    return limit;
 }



Timer::Timer (): hours(24), minutes(60)
// Initialize a new Timer object
// setting max hours to 24and minutes to 60
{
// initialization is done in the heading!
}
void Timer::Increment ()
// Add  1 minute to timer
{
   minutes.Increment();
   if (minutes.GetValue() == 0)    // Minute counter turned over
      hours.Increment();           // so increment the hours counter
}
```

```
      int setting;                // user-input values for hours/minutes

      cout << "Set hours to what value?\n";
      cout << "Enter an integer between 0 and " << hours.GetLimit() << ": ";
      cin >> setting;
      hours.SetValue (setting);     // Set hours

      cout << "Set minutes to what value?\n";
      cout << "Enter an integer between o and " << minutes.GetLimit() << ":";
      cin >> setting;
      minutes.SetValue (setting);     // Set hours
   }
   void Timer::Show ()
                        // Show hours and minutes
   {
      hours.Show();
      cout << ':';
      minutes.Show();
   }

 //  Taken from the book The Object Concept by Rick Decker
 //  and Stuart Hirshfield

 // Declarations of classes Display and Timer

 class Display
 // A Display object stores and displays a single integer
 // That integer is always in the range 0 .. limit-1, where
 // limit is alos stored in the class
 {
 public:
   Display (int lim);                    // Initialize a new Display object
   void Increment ();                    // Add 1 to value
   void SetValue (int val);                    // Set the value

   int GetValue ();                      // Return the current value
   void Show ();                         // Show the current value
   int GetLimit ();                      // Return the limit

 private:
   int limit,                            // Largest possible value
       value;                            // Current value (0 .. limit-1)
 );


 class Timer
 // A timer object consists of two Displays, one for hours
 // and one for minutes.  When the timer is incremented and
 // minutes becomes 60, minutes is reset to 0 and hours is
 // incremented.
 {
 public:
   Timer ();                                // Initialize a new Timer
                                            // setting max hours to 24
                                            // minutes to 60
   void Increment ();                       // Add  1 minute to timer
   void Set ();                             // Set hours and minutes
   void Show ();                            // Show hours and minutes

 private:
   Display  hours,                          // two displays, one for hours
            minutes;                        // one for minutes

 );
```

```
// ---------------  Main.cpp  ---------------

#include <iostream.h>                    //for cout, cin
#include "CostCoun.h"                   //for Counter and Display

void main ()
{
  Counter t;   // Create and initialize a counter object named "T"

  cout << "Here's the initial value of the counter: ";
  t.Show();
  cout << "\n\n";

  t.Set();       // Allow the user to set the counter's value
  cout << "Here are the new settings: ";
  t.Show();
  cout << "\n\n";

  cout << "Now were run for 10 times ... \n";

  for (int i = 0; i < 10;  i = i + 1)
  {
     t.Increment();
     t.Show();
     cout << "\n";
  }

  // Freeze the screen until the user presses a key
  cout << "\nPress a key followed by Enter to terminate ...";
  char any;
  cin >> any;
  cout << "\n Processing completed ... Good bye!\n";

}
```

```
//---------------  DigitTime.cpp ------------------

// Implementation of classes Display and Counter
#include <iostream.h>                    // for cout and cin
#include "Costcount.h"                   // for Display and Timer Declarations


 Display::Display (int lim)
 // Initialize a new Display object
 {
     value = 0;
     limit = lim;
 }
 void Display::Increment ()
 // Add 1 to value
 {
    value = value + 1;
    if (value == limit)
       value = 0;
 }
 void Display::SetValue (int val)
 // Set the value
 {
    if (val < 0)
       val = -val;
    value = val % limit;
 }
 int Display::GetValue ()
 // Return the current value
 {
    return value;
 }
 void Display::Show ()
 // Show the current value
 {
    if (value < 10)
       cout << '0';
    cout << value;
 }
 int Display::GetLimit ()
 // Return the limit
 {
    return limit;
 }



Counter::Counter (): dollars(100), cents(100)
// Initialize a new Counter object
// setting max dollars to 100 and cents to 100
{
// initialization is done in the heading!
}
void Counter::Increment ()
// Add  1 cent to counter
{
   cents.Increment();
   if (cents.GetValue() == 0)   // Cent counter turned over
      dollars.Increment();          // so increment the dollars counter
}
```

```
{
  int setting;              // user-input values for dollars/cents

  cout << "Set dollars to what value?\n";
  cout << "Enter an integer between 0 and " << dollars.GetLimit() << ": ";
  cin >> setting;
  dollars.SetValue (setting);    // Set dollars

  cout << "Set cents to what value?\n";
  cout << "Enter an integer between 0 and " << cents.GetLimit() << ":";
  cin >> setting;
  cents.SetValue (setting);    // Set cents
}
void Counter::Show ()
                    // Show dollars and cents
{
  dollars.Show();
  cout << '.';
  cents.Show();
}
```

```
// Declarations of classes Display and Counter

class Display
// A Display object stores and displays a single integer
// That integer is always in the range 0 .. limit-1, where
// limit is also stored in the class
{
public:
  Display (int lim);                    // Initialize a new Display object
  void Increment ();                    // Add 1 to value
  void SetValue (int val);              // Set the value

  int GetValue ();                      // Return the current value
  void Show ();                         // Show the current value
  int GetLimit ();                      // Return the limit

private:
  int limit,                            // Largest possible value
      value;                            // Current value (0 .. limit-1)
};


class Counter
// A counter object consists of two Displays, one for dollars
// and one for cents.  When the timer is incremented and
// centes becomes 100, cents is reset to 0 and dollars is
// incremented.
{
public:
  Counter ();                            // Initialize a new Conter
                                         // setting max dollars to 100
                                         // cents to 100
  void Increase (int p);
  void Increment ();                     // Add  1 cents to counter
  void Set ();                           // Set dollars and cents
  void Show ();                          // Show dollars and cents

private:
  Display  dollars,                        // two displays, one for dollars
           cents;                       // one for cents

};
```

Programming Hypercube Machine ...

- Communications
  - csend & crecv
- Global operations
  - gssum etc.
- Hypercube Programs
  - Host program (will 'load' the node program)
  - Node program
- Hypercube Access and Examples
  - Courtesy of CSU San Bernardino

Compare with P4 -

Implementation on PVM

- Overview
  - Heterogeneous network of computers that function as a single parallel computer (virtual computer)
    - Started at Oak Ridge National Lab in 1989
    - Available via anonymous ftp netlib2.cs.utk.edu or email to netlib@ornl.gov (send index) — send Index
    - Newsgroup: comp.parallel.pvm (FAQ, ...)
    - User defines the virtual computer
  - Machines supported
    - Sun, RS6000, DEC Alpha, CM5, Intel Paragon, ...
  - Communication mechanism: message-passing

PVM Features

- Language supported: C, C++ or FORTRAN
- Graphical, X-based tools: HeNCE, XPVM
- Composed of two parts
  - Daemon
    - pvmd resides on each node of the virtual computer
    - virtual machine can be configured: use hostfile, add interactively or dynamically reconfigure (must have an account on hosts)
  - Library of interface routines
    - for spawning processes, message passing, etc.

PVM Specifics

- All tasks must enroll in PVM; tasks are assigned a unique task id (tid)
- If a host fails, PVM will automatically detect this and delete the host from the virtual machine
- PVM supports task group. a task can belong to multiple groups, and groups can change dynamically
- PVM provides routines for packing, sending and receiving messages

Process Control

- pvm_mytid()
  - enrolls a process into PVM and generates a unique id if not done with pvm_spawn(); must be called before any other PVM calls in the program
- pvm_exit()
  - a process leaves PVM
- pvm_spawn()
  - creates new PVM processes
  - more frequently used than pvm_mytid()

Process Control ...

```
int tid = pvm_mytid ( void );
int info = pvm_exit ( void );
int numt = pvm_spawn ( char *task, char **argv, int flag, char *where,
                       int ntask, int *tids);
```

task: name of executable file
argv: parameter to executable file
flag: spawning option, for example
  PvmTaskDefault -- PVM chooses where to spawn
  PvmTaskHost --Where parameter says where to spawn
  ...
ntask: how many copies of executable to start
tids: integer array of task ids of length ntask
numt: returns number of tasks started (useful for debug)

Message Passing

- Features
  - Asynchronous blocking send
  - Asynchronous blocking/non-blocking receive
  - Point-to-point communication
  - Multicast to groups (selected ones in the group)
  - Broadcast to groups (everyone in the group)
  - Reduce (global operations)

Message Passing ...

- Sending a message requires three steps
  - initialize a send buffer
  - pack message into send buffer
  - send the completed message
- When receiving a message
  - calling a blocking/non-blocking read & unpack
- Receive routines can accept a message
  - from any source, from a specific source, or with a specific message tag

Message Buffers

- pvm_mkbuf() –creates a new, empty buffer
  int bufid = pvm_mkbuf (int encoding);
  – encoding: PvmDataDefault - XDR encoding or none
    PvmDataRaw - no encoding is done , etc.
- pvm_initsend() –clears the send buffer
  int bufid = pvm_initsend (int encoding);
- pvm_freebuf() –frees a buffer
  int info = pvm_freebuf (int bufid);
- Packing and unpacking data
  pvm_pkbyte, pvm_pkint, pvm_pkfloat ...., pvm_upkbyte, ...

Sending and Receiving

- pvm_send() –send a tagged msg to a specified process
  int info = pvm_send (int tid, int msgtag); –tag specified in packing
- pvm_psend() –pack and send, combine three steps to one
- pvm_nrecv() –nonblocking receive; return 0 if no msg available
  int info = pvm_nrecv(int tid, int msgtag);
  - -1 for tid means to accept any message
- pvm_recv –blocking receive
  int info = pvm_recv(int tid, int msgtag);
- pvm_precv() –blocking receive and unpack

Example

- Matrix Multiplication on a Ring

spmd.c

Other Issues

- Dynamic Process Groups
  - pvm_joingroup, pvm_lvgroup, pvm_bcast ...
- Scheduling
  - static (block & interleaved)
  - dynamic (processor farming, etc.)
  - adaptive scheduling (on-the-fly, processes examine their load, balance load by sending or receiving tasks.)
- Debugging
  - very difficult, deadlock is a common problem
  - tools: HeNCE, dbx, ...
  - run on single processor first, then try multiple processors

graphics tool

```
#define NPROC 4
#include "pvm3.h"
main()
{
    int mytid, tids[NPROC], me, i;

    mytid = pvm_mytid();    /* ENROLL IN PVM */
    tids[0] = pvm_parent(); /* FIND OUT IF I AM PARENT OR CHILD */
    if( tids[0] < 0 ){      /* THEN I AM THE PARENT */
       tids[0] = mytid;
       me = 0;              /* START UP COPIES OF MYSELF */
       pvm_spawn("spmd", (char**)0, 0, "", NPROC-1, &tids[1]);
       pvm_initsend( PvmDataDefault );   /* SEND TIDS ARRAY */
       pvm_pkint(tids, NPROC, 1);        /* TO CHILDREN     */
       pvm_mcast(&tids[1], NPROC-1, 0);
    }
    else{                    /* I AM A CHILD */
       pvm_recv(tids[0], 0); /* RECEIVE TIDS ARRAY */
       pvm_upkint(tids, NPROC, 1);
       for( i=1; i<NPROC ; i++ )
          if( mytid == tids[i] ){ me = i; break; }
     }
/* All NPROC tasks are equal now
 * and can address each other by tids[0] thru tids[NPROC-1]
 * for each process 'me' is process index [0-(NPROC-1)]
 *-------------------------------------------------------------*/
     dowork( me, tids, NPROC );
     pvm_exit();             /* PROGRAM FINISHED EXIT PVM */
}
dowork( me, tids, nproc )    /* DOWORK PASSES A TOKEN AROUND A RING */
     int me, *tids, nproc;
{
     int token, dest, count=1, stride=1, msgtag=4;
     if( me == 0 ) {
        token = tids[0];
        pvm_initsend( PvmDataDefault );
        pvm_pkint( &token, count, stride );
        pvm_send( tids[me+1], msgtag );
        pvm_recv( tids[nproc-1], msgtag );
     }
     else {
        pvm_recv( tids[me-1], msgtag );
        pvm_upkint( &token, count, stride );
        pvm_initsend( PvmDataDefault );
        pvm_pkint( &token, count, stride );
        dest = (me == nproc-1)? tids[0] : tids[me+1] ;
        pvm_send( dest, msgtag );
     }
}
```

C version of SPMD example.

ATM Networking Team

Connecting the Networking Dots
Campus Communcations
Volume 3, Number 7 p. 12-14
by Glenn Ricart

"Connecting the Networking Dots" is an article which gives important information about the preparations of new technologies for higher education. Most importantly, new architecture for the national network, the "information superhighways". Soon all of America will be interconnected with the "information superhighways", especially in educational institutions. A seventy-five percent investment in higher education networking will be made on campuses.

In regard of wiring, buildings on campus should be wired with category 5 home-run wiring (which is relatively inexpensive), with maximum runs of meters or less. The marketplace for high speed networking over twisted pair will always be dominating. Home-run wiring that is stored in a wiring closet where network hubs allow single bad cables and workstations to be isolated. Conduits consists of multimode fiber for FDDI (fiber-distributed data interface) which are useful contents involved with sub-ducts (allows pulling of cables) and pull cables.

Another alternative in networking is wireless networking. Mobile computing that connects to a wireless network, is certainly an competitive opponent in the world of technology. The technologies that will provide for mobile computing are **infrared digital transmission** and **high-frequency radio transmission.** In cases using radio transmissions you would need power and wiring to antenna sites that could share a local wireless network. This could mean that data outlets in places such as copy centers and wire closets. Wire communication is more reliable in wiring lecture halls and fixed-seating classrooms with category 5 twisted pair outlets and power plugs at each student desk.

Higher networking costs is non-avoidable as all campuses have rapidly growing networking infrastructures. More infrastructure means more investment, higher operations costs, and higher replacement costs.The universal trend of networking has increased 7% as people use internet resources externally. More resources for the internet are now available. More offer pictures, sound, and larger programs. As far as external cost, future cost will definitely increase because of the build-up pressure for a higher-speed. The reason for higher cost is pending demise of direct federal funding for the national internet backbone.

In conclusion, the computer networking revolution is in its premature stage, consider it as unstable and unpredictable. Physical aspects appear with our attention focused on the long-term impact on higher education. The future holds mind expanding possibilities that of course reinforce the need for higher education in the networking world. ..

Article Summaries

"ATM in the Mix"
Internet World p. 27-32
By: Michael Yip

ATM has been awaited by networking technology ever since the 1980's. The bandwidth production rate has been booming for the past decade. The interfaces range from a couple of megabytes to hundreds of gigabits per second. There is a 53 byte cell structure which enables traffic over a single transport. ATM offers uniformity and simplicity, which makes it more powerful, scalable, and extensible.

A year ago, ATM products came out on the market. Since then the prices has dropped more than 50 percent. Which has made ATM technology more of a reality for most companies.

The ATM Forum is a group of more than 600 vendors and end users who are working to develop specifications and implementation agreements that will yield interoperable, reliable, and manageable ATM networks. ATM is a 21st century product, but with the equipment needed, such as adapters, switches, network management tools, and staff training, it can be very costly.

All ATM services that are in need of communication with devices are attached to a Local Area Network (LAN). Those services include servers, routers, and LAN-to-ATM edge services. The maximum number of LAN is 65,278 LECs(LAN Emulation Client). LAN is designed to be easily compatible with other shared-media. Design decisions that affect the configuration and performance will have to be made by the networking managers. The networking managers have do decide where the LES and broadcast servers location, maximum packet size, and LAN type. LAN devices need to be configured for maximum packet size, during network installation. Most parameters are 1,516 for Ethernet and 4,544 or 18,190 for Token ring networks. LANs that must communicate often with Ethernet devices should be configured for the IEEE 802.3 frame type. Those path need to communicate largely with Token Ring devices should be configured with the IEEE 802.5 frame type.

To succeed in corporate applications, ATM will have to solve current and future networking problems and coexist with existing equipment. LAN emulation will be a key element in this equation.

Transcript of Conference Call with Adnet, Inc.
The System Administration Team

Sharon Saunders
Kevin Trotman
Kuchumbi Hayden
Curtis Felton, CV
Denisa Edwards, CV

Dr. Hayden: We are starting the recording.
Ashok: We are on the box now. Okay

Dr. Hayden: Yeah. We are on now. Okay. We have some questions for you. Do you have access to the ATM proposal that you submitted?
Ashok: Yes I do. Hold on a second... Okay here we are.

Dr. Hayden: Okay. Lets get some on the terminology straight first. Things like a functional description. What will a typical functional description consist of?
Ashok: A function description is something like... Say your requirement is... do you want to have a bunch of your labs and offices interconnected to each other. And then the office will have a 10baseT setup. And labs will have a ATM or FDDI or what ever have you. A function description will describe that, the functionality, and what that will get you after this job is done. The functionality should have this kind of performance, and it is a guideline for the requirements and what it is you are going to get.

Dr. Hayden: So then we will be able to look at the functional description. And say that we will be able to have, like FTP...
Ashok: Right. For example, functional description for ATM switch and adaptors. Will say what a ATM switch should do. What we will be recommending is what you should purchase. Functionally what specks it should have, how it should function, how many packets it should transmit, and what kind of interface it should have, that kind of stuff. How many ports it should have. So that would be a technical description. In fact, you would take the functional description and based on

that we will say exactly these are the things that we should have. And this is the vendor that we think that you should go with. This will be a very defined and pointed specification.

Dr. Hayden: And when will we be at that stage, after the visit?
Ashok: Well once we come and visit. We will come and take care of things like that, and hopefully we will have our sub-contractor picked out by that time. And then we will go from there and start developing the functional description. Which then we will send it to you. During the visit, we will talk to you and get your ideas and assessment of other people. Who is your vendor that you are leaning towards? And then we can come up with a price. You need that price or you can not speak in terms of acquiring the equipment.

Dr. Hayden: Actually,we needed some information for the biders on the primes distribution system, they were very much concerned about the number of drops?
Ashok: Okay. That functional description which you're talking about will also have a function description of the PDS, the wiring, and all those things. Which is called cable specification R. Those vendors need to see that. We have that. We have developed most of it. I have not sent you that yet.

Dr. Hayden: There is some indication of preliminary information gathered in the design section, of drops by room and type.
Ashok: Hold on one second.... What section are we talking about?

Dr. Hayden: Page six.
Ashok Page six, okay I am at page six.

Dr. Hayden: The drops by room and type, table that you supplied here. Now the total ATM drops and the total 10baseT drops are a hundred.
Ashok: Yes, 29 plus 71 equals a 100.

Dr. Hayden: Okay. That is pretty much what we came up with when we did our primas distribution walk though also. But one of the vendors gave me a approximate cost of $22,000 as opposed to $18,000. But we can talk about that later.

Ashok: Well actually some of the vendors gave me $30,000.
_____DECISION OF COST DELETED_____

Ashok: Well. You have some concrete you have to drill through.
Dr. Hayden: Maybe, maybe not. We do not have to come through the concrete. We may be able to come though the ceiling. In those cases that would bring the cost down. The second vendor is Charles Ainsley. He is with Sprint Carolina Telephone, and his number is (919)641-3108. I'm going to send you by mail a copy of the diagram that shows the number of drops that we calculated in each room. All right, lets move on to some of the other questions.

Kevin: I what to know what kind of software or protocol changes we are going to have to make on the workstation we have here?
Ashok: On your workstations, all the workstation which you have. The one thing that all workstations should have, UNIX base workstations; you should have TCP/IP in there and you should have ethernet cards in there already. Is not that true? (yes) For PC's you have to have ethernet card, you will need TCP/IP for those machines. There are a couple of ways to go about that. If you already have TCI/IP running on those machines, fine. If you do not, you go head and buy it from commercial vendors, that is one way to do it. Or, you can get a lot of TCP/IP's software from public domain and install it there. Trumphet is a very good product, and another is NCSA, that is also a good one. If you have any question about that. Call the Muspin help desk, they can help you with that. That is what they do, they have a list of all the public domain software and they can also tell you where we can get them. Okay, but that is all that you should have, for high power workstation. What you need is a ATM card that is part of the requirement. And that card should come with the driver software, which will drive the ATM traffic to that card, as far as the workstation goes. And then you will have to make changes in the configuration in Aldus workstation. Because you will be behind a router so that change has to be made, and that will be difficult and we'll take care of that when we get there. When we decide what our address is and how we are going to reconnect it. Those are more in the implementation phase. There will be changes in

the configuration. You will have to modify the workstation and we will be there to help you guys with that.

Kevin: All of our workstations have built in Ethernet interfaces.
Ashok: Well. That is good. Then you do not have to drop in a new card there. You already have ethernet, you just have to configure it differently. You have right now on your workstations. You talking about UNIX base workstations or PC's? (UNIX) UNIX workstations. You already have built in ethernet cards and you probably already have TCI/IP running on those things. Well that is fine. You will continue using that the way it is and you may have to make some changes. We will not know what changes will be made and what we will have to do, untill we actually get to the implementation phase. When we start to implement this thing, and then we have to see what changes we have to make. What ever change it is, it is very simple, its not that complicated. We will give you detailed instructions on how to go about that.

Kevin: On the machines that have built in ethernet interfaces, we will not be able to get maximum through put without using an ATM card, correct?
Ashok: That is right, that's why you have to buy the ATM card, and that card comes with a driver and in your routing, your workstation will have two addresses, one will be for ethernet and one will be for ATM.

Dr. Hayden: We're budgeted for 15 ATM cards at $1400 a piece.
Ashok: That's about right, so what will happen is, take for example, you have an SGI workstation where there is an ethernet card right now that it uses to talk to the campus and on the internet. Then we're going to drop an ATM card there on that workstation. We'll have to open the workstation and drop the card there. Once you drop the card, that card has to be configured and your driver has to be configured properly so that it recognizes that there is another device in the machine and that also has to be defined so that when you are sending ATM traffic, it has to go to the ATM port. As you said, it cannot go to the ethernet port, ethernet is only 14 to 16 bytes, ATM is 52. You know, it is different, different bytes, different

protocol, and different scheme. So it has to go to a different port. Its not that complicated, you know. When we come there we will go over it and we will discuss it, how its going to work and all those things. And as far as configuration goes, its a little tricky, but not impossible. The biggest thing is taking off the chassis and putting in the card and then packing it back as it was.

Kevin: The router that you have in this proposal, you have a router and switches. What is the purpose of the router, is that redundant with the switches and the router that we have in the administration building or is there a purpose for that?

Ashok: Ok, realize what we have here. You do not have to have a router, that goes without saying. You can solve the problem with the switches. Just buy the proper switches, which also then connects to another concentrator and wiring hubs. Which have an interface to connect the switch. You can do away with the router. The reason you have a router here is that you are going to have two networks here. You are going to have one network which will be on ATM, you will have one ATM network and one 10baseT network, you have two separate networks. You can play the fancy games with the switch or the concentrator and have them talk as long as they are on the same class or net address, but if they are different classes of net address; you will need a device such as a router or a smart bridge to pass the traffic between these two LANs. That is why you need to have a router, that's one thing. Secondly, this is a lab that you have, you want to control your lab traffic to the administrative LAN, which I am talking about the campus LAN. So, suppose you're working in the lab and something happens, if you're not behind the router it can go across that LAN to the rest of the campus and it can do some damage. So, by having a router you can control those type of things.

Dr. Hayden: So that's a protection from us for the campus?

Ashok: That's one thing, also the bigger issue here in my mind. You have 15 SGI workstations which will be on ATM, then you will have about 70 that's going to be on your 10baseT. Just think about the physical wiring plan, not the network. Physically

there are two different wiring schemes right there, one is 10baseT and one is your ATM which is fiber. Now these two are two separate networks, but now these two have to talk to each other. There are many ways you can do it. You can put a device at one end. (Conceptually, we are not going into detail.) But you can put a device there, where one end is TP and one end is fiber, and then this guy can interconnect these two LANs. That will work and then you don't need to buy the router as long as you are keeping the same net address. You can do that, but the problem is that you don't have any protection or control of data going out of your LAN or coming to your LAN. That is the difference between a router or say a bridge or concentrator or hub or switch for that matter. A router has a smart net, it controls the controls of data, what goes and what doesn't. A bridge or hub will just take the data and pass it along.

Dr. Hayden: So, we get no control over the data with this router?

Ashok: With a router, yes you do. You get control over who comes into your LAN and who goes out of your LAN and what type of data is coming to you. Also, anytime a LAN is connected to an operational LAN, which the campus will be, the campus is not only going to support math department or the computer science department, but other departments. Once you are connected to an operational lab, and that is what we recommend and again its up to you because ultimately you have to spend the extra money for the router, in a lab where your going to be making changes or whatever where its not an operational environment. You want to have that behind a router or something. If something goes wrong, then you are not destroying the rest of the operational LAN. Secondly, by having a router you are free, then you can make changes in the future. Whether you buy a router today or you buy it a year or two years down the road, you will have to buy a router. I can pretty much guarantee you that.

Kevin: Will they be using fiber obtic line or will they be using twisted pair coming into the labs?

Ashok: Okay. That is a requirement that has been given to us, and that is what we are going by. And if you go and look at page six,

its says that in information gathering and design. Under that, it says drops by room and type. Feel free to make corrections and changes to this if you will. This is what we felt. Is 115 the lab? (yes) we see that 26 under ATM and 116. When we came there and talked to Dr. Hayden thats the number that we got and have, if you have changed since then, we will make changes accordingly. But everything you see under ATM is fiber board. 10baseT is twisted pair as you said.

Kevin: Is there a significant difference in the cost of pulling the fiber as opposed to the coxal?

Ashok: It is different, of course, because you have fibers, you are talking about different kinds of mediums and it is expensive. But not as expensive a cost difference as it used to be.

Dr. Hayden: Mr. Spencer has approached me about having all the cables being fiber.

Ashok: Well, I don't think that you can do that, I am talking about technically. You already have ethernet cards in your workstations. Now, if you pull the fiber and if you bring the fiber, how are you going to connect the fiber to ethernet polls.

Dr. Hayden: There is a possibility of having a combination of fiber and coaxial pulled. That is an expensive endeavor?

Ashok: No. It is not. There is one thing we can do, and its not that expensive, you can have several fibers pulled over, you need to have fiber for ATM with out saying, because ATM will not run over your twisted pair or 10baseT.

Dr. Hayden: Another concentration, because we had to do some shuffling of the SGI money for the network. We are looking at the possibility of having some of our X stations, run of some of our SGI's that we did purchase. And we want to know what considerations we need to be aware of as far as that configuration.

Ashok: Okay, we are talking about X stations. I guess they will be on 10baseT, as far as the network goes. I do not know what extension you are buying from the vendor, and I'm not sure if the X station can take it.

Dr. Hayden: We have not approached any vendor yet. But when we do, what kind of points should we make with him?

Ashok: The most important thing in a X station is how much memory you have. I'm ruff in UNIX. But as far as network is concerned is all X stations should be TCP/IP and ethernet card, you should be fine.

Kevin: What speed will the ATM link be working at, is that a 155 mega byte per second?

Ashok: Yes, that is what it is right now. I do not think you are going to get that one. But it is the best one, and what the vendor would like to give you.

Sharon: Do we need any network detection software, that would detect any errors or anything within the system?

Ashok: Usual ECPI has built in ECPI detection software that you can use to get the primary idea if something is wrong. But we have something that is not on this, but in another proposal that I have worked with Dr. Hayden, during so. We have planned to implement another management center there. That will take care of all of the instances that you have mentioned that will collect all of the data there. It is not part of this work. But it is related work.

Sharon: What additional changes do we need to make to get the maximum output from the ATM lines?

Ashok: That depends on the vendor that you choice for the switch and router and the ATM wiring. The drives and things like that would give you things like that.

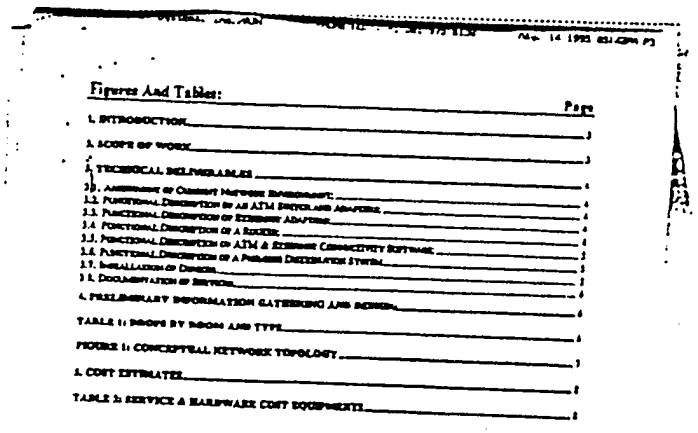
ADNET Systems, Inc.

Elizabeth City State University

Math and Computer Science Department

ATM & Ethernet Local Area Network
Scope of Work

Prepared for Dr. L. Hayden



Figures And Tables: Page

1. Introduction

The purpose of this document is to provide to Elizabeth City State University's Math and Computer Science Department (ECSU) the scope of work that ADNET Systems, Inc. will perform.

2. Scope of Work

In general, ADNET will provide engineering services for the design, recommendation, procurement, and installation of both an Asynchronous Transfer Mode (ATM) and a 10BaseT Ethernet Local Area Network (LAN) environment. ADNET will provide engineering services which will result in:

1. An assessment of the current network environment in the Math and Computer Department, including workstations and PCs, and the available network cabling;
2. The functional description and specification of an ATM switch and ATM adapter devices for workstations and PCs;
3. The functional description [illegible] specifications for Ethernet adapters for workstations and PCs;
4. The functional description and specification of a communications device (router) to provide connectivity between the ATM Lab and the campus networked computing systems;
5. Specification and recommendations for ATM and Ethernet connectivity software;
6. and, The functional description and specifications for a Premises Distribution System (PDS), to include Intelligent Wiring Hubs (IWHs), ATM cabling system, and the 10BaseT cabling system;

ADNET will provide, at ECSU's option, continuing engineering and implementation / operational activities to assist ECSU with the procurement, installation, and continued use and development of the ATM Lab and the LAN.

The above scope of work has been developed during site visits and teleconferences with Dr. L. Hayden of the Math and Computer Science Department. The information presented here is preliminary, and should be considered conceptual. Detailed designs and specifications will be produced upon acceptance of this outline and the functional descriptions. All recommendations will be based upon industry standards and technologies. This Scope of Work encompasses only those previously identified locations within Lester Hall on the ECSU campus.

Upon ECSU approval of the functional descriptions for the systems and equipment briefly described above, ADNET will provide detailed specifications for the desired equipment, systems, or services.

3. Technical Deliverables

3.1. Assessment of Current Network Environment:

ADNET will perform a detailed survey of the existing networked computing environment in the Math and Computer Science Department. This assessment will examine available workstations and PCs, LAN cabling, connectivity to the campus network and inter-networking devices, and current distribution and expected growth of computing devices. In addition, the impact of implementing the ATM Lab will be considered.

ADNET will evaluate each identified workstation or PC for suitability to connectivity to the ATM switch or the Ethernet LAN. This evaluation will include determining if the workstation or PC has sufficient processing power, memory, storage, and adapter for connection. Each workstation or PC will be assessed and recommendations made as to whether the workstation or PC is acceptable as-is, if minor modifications or major upgrades are necessary, or if the unit would be unacceptable for the intended use.

This assessment will result in specifications for upgrading or replacing hardware or software. Upon acceptance, and approval by ECSU, of the assessment, ADNET will prepare specifications for and provide procurement of the approved recommendations. ADNET will configure the workstations or PCs for the intended use: either as a normal Ethernet attached node, or with the addition of ATM capabilities.

3.2. Functional Description of an ATM Switch and Adapters:

ADNET will develop and deliver the functional specifications for an ATM Switch and ATM adapter devices for workstations and PCs. Functions and features, such as full bandwidth availability, multiple concurrent [illegible]nnections, equipment expandability, standards compliance, and suitability to the desired use, will be prominent features and functions. The ATM Switch will support industry recognized standards as of the date of specification / procurement. The ATM Switch will be compatible with the selcted router.

Due to the still maturing nature of ATM technology, adherence to already published standards, support of multiple proposed standards, manufacturer's industry knowledge and reputation, and product availability will be some of the prime considerations when recommending a particular vendor or vendors.

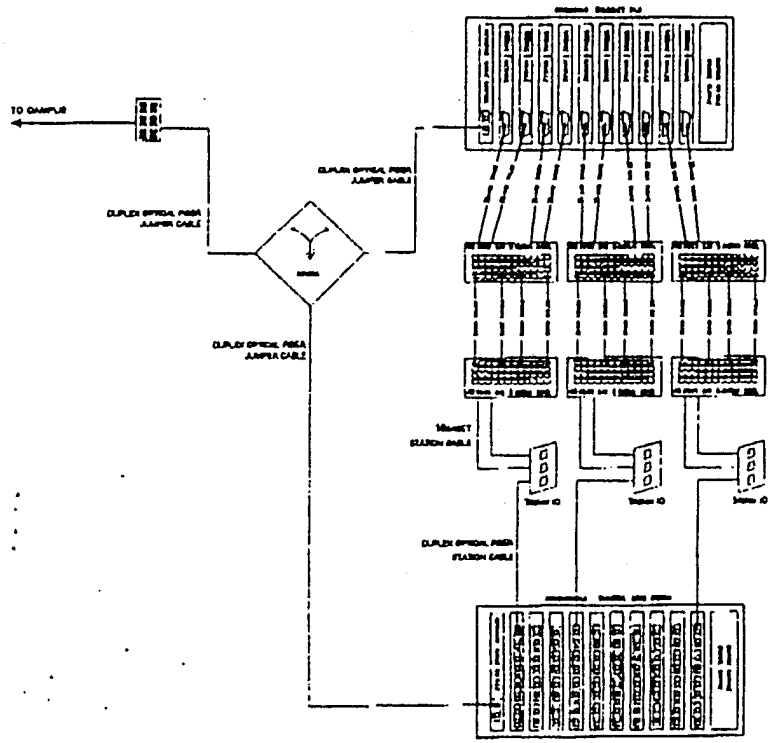
3.3. Functional Description of Ethernet Adapters:

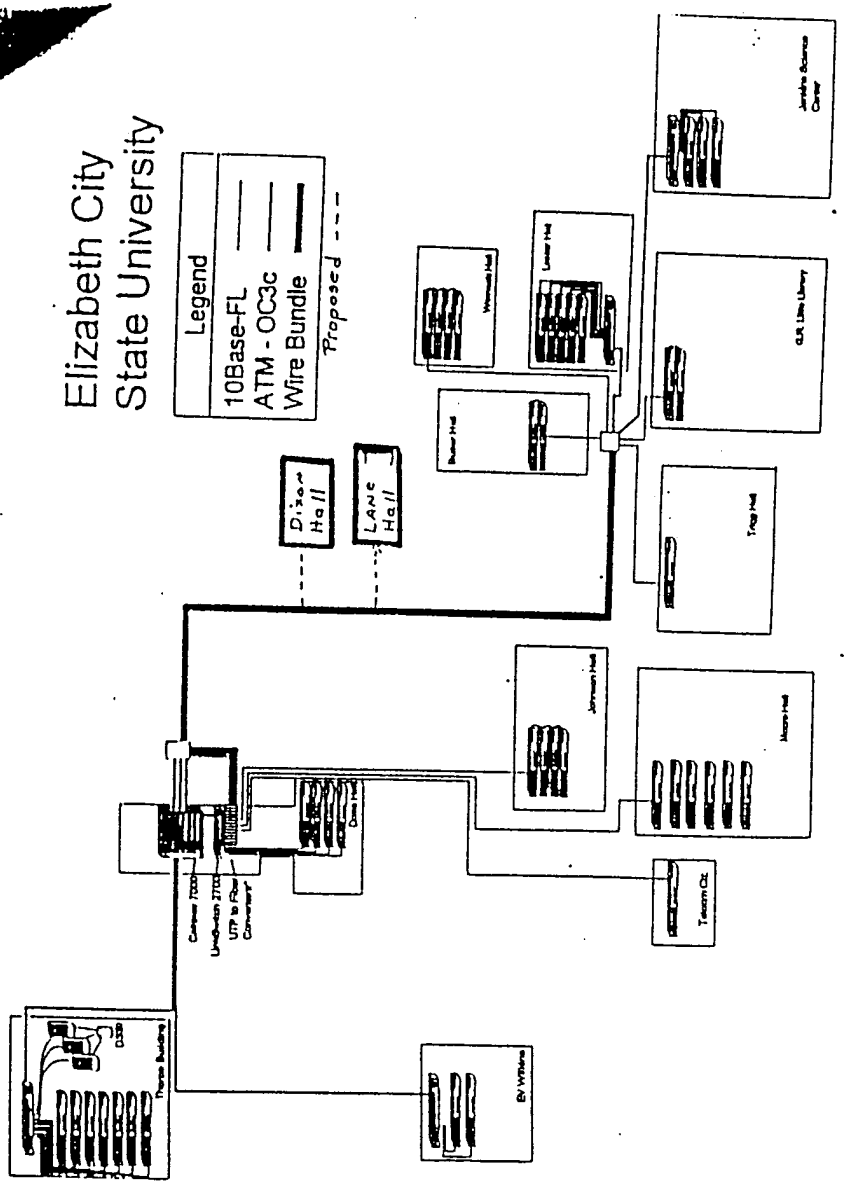
A functional description of features and compatibility for Ethernet adapters for both workstations and PCs will be provided. Emphasis will be placed upon standards compliance, vendor reputation, quality, ease of installation and use, and support by the intended software environment. Ethernet adapters are now considered a commodity in the computing industry, and so vendor reputation and market penetration will be weighted when comparing vendor's products.

3.4. Functional Description of a Router:

ADNET will provide a functional description of a communications device to provide routing of network traffic to and from the ATM LAN, the Ethernet LAN, and ECSU's academic and administrative computing networks. Due to the inter-networking demands

Figure 1: Conceptual Network Topology





placed upon a routing device, high performance will be a primary feature of the router functional description. Additional functionality and support of industry standard protocols (both network, such as TCP/IP, and router, such as OSPF and IS-IS) will also be considered. An ATM interface native to the router is very desirable.

Compliance with industry standards, configuration interface ease of use, and reliability are to be included when developing the recommendations.

3.5. Functional Description of ATM & Ethernet Connectivity Software:

ADNET will research and develop functional specifications for software that supports the intended use in the University environment. The range of operating systems supported, support of hardware, (and hardware compatibility with the software) and ease of use are primary features and functions.

3.6. Functional Description of a Premises Distribution System

Premises distribution refers to the physical construction of an engineered communications infrastructure, usually in a building or campus environment. By applying sound engineering principles, careful design, appropriate product selection, and proper installation, a premises distribution system can be counted on to deliver high performance, error free communications for many years. Premises distribution is properly referred to as a system, as many variables, including intended use, capacity for growth, adherence to standards, change cycles, and life cycle cost are considered when designed.

ADNET will design an engineered, manageable, and reliable communications premises distribution system. Doing so will provide benefits to ECSU such as much less time spent by support staff performing adds/moves/changes; reliability, ability to take advantage of emerging local communications technologies, manageability, and a common, standard wiring methodology.

Included in the PDS for ECSU will be a functional description of Intelligent Wiring Devices (IWHs, also referred to as "hubs" or "concentrators"). The hubs must provide full compatibility with installed base of SynOptics concentrators and IWHs and with the ECSU campus standard management system. The IWH will provide connectivity based upon the 10BaseT standard. Evaluation criteria of the hubs will include the interoperability of the hub's management capabilities with industry standard network management paradigms.

ADNET will provide to ECSU a design and specifications for a PDS, including hubs, to be installed into the Lester Hall. ECSU may choose to further contract with ADNET for the procurement, installation / implementation, and sustaining engineering of the PDS, ADNET can provide contracting services to an ECSU specified sub-contractor for the PDS, or ECSU may elect to provide the designs and specifications to another company for implementation, with or without ADNET supervision of the contractor. ADNET will endeavor to utilize local sub-contractors whenever practicable and cost-effective.

3.7. Installation of Devices

Upon procurement of hubs, switches, adapter cards, and router, ADNET will schedule the installation and configuration of the devices.

3.8. Documentation of Services

ADNET will provide the above referenced functional descriptions, and upon approval, detailed specifications and designs. ADNET will also provide drawings / diagrams of the installed PDS.

4. Preliminary Information Gathering and Design:

ADNET has collected a small amount of the information required to properly provide the engineering services as described in the preceding sections. Based upon this preliminary information, a conceptual design of the ATM and Ethernet LAN has been produced. This design is shown in Figure 1. Table 1 has a compilation of data about the quantity and locations of computing devices to be used by the Math and Computer Science Department. The design depicted here is preliminary, and is subject to change.

Table 1: Drops by Room and Type

Floor	Room	ATM Drops	10BaseT Drops
1	116	1	1
1	109	0	1
1	113	0	1
1	122	1	1
1	115	26	26
1	Chair office	0	1
1	Dr. Hayden's office	1	1
1	Office 1	0	2
1	Office 2	0	1
1	Office 3	0	1
1	Office 4	0	1
2	Calculus Lab	0	15
2	Critical Thinking Lab	0	15
2	Office 1	0	2
2	Office 2	0	2
	Totals	29	71

System Administration Team
Weekly Report for July 10-14

Sharon Saunders
Kevin Trotman
Kuchumbi Hayden
Curtis Felton, CV
Denisa Edwards, CV

This summer there will be a numerous amount of changes in our networking system in Lester Hall at Elizabeth City State University. We will be changing from a Ethernet network to a ATM network in Lester Hall Rooms 113, 115, 116 and Dr. Linda Hayden's office. There will also be an expansion of an Ethernet network in all of the offices and labs in Lester Hall. The entire building will be able to access the information super highway.

ATM stands for asynchronous transfer mode. ATM is a technology based on a switched network. It uses dedicated media connections: Each connection between users is set up physically by establishing its own path through a series of integrated circuits (ICs) in the switch. On an ATM switched network, all connections could be running intensive applications, including video conferencing, without greatly affecting network performance.

Four major benefits of this system are:

1. Scalability
2. Statistical Multiplexing
3. Traffic Integration
4. Network Simplicity

Scalability - This is one of the most valuable properties of ATM. The main factors in providing this scalability are a switched-based architecture and a common cell structure across all ATM components. Conventional LAN technologies such as ethernet are limited by the delays involved in the attempt to coordinate the sharing of the link bandwidth. Users can access ATM networks with a variety of connections regardless of media types and applications.

The contribution of the common cell structure allows for data to be transported in the same format over the entire network regardless of the data rates at the intervening subnetworks.

Statistical Multiplexing - This allows for more sources to be admitted by peak rates. And at the same time statistical variations in the traffic load can be smoothed out as many sources are multi-plexed. This results in much better utilization of the shared resources. There is a possibility that there may be too few traffic sources to fully exploit the

benefits of statistical multiplexing being that it's true benefits are not recognized with fewer than 18 random sources.

Traffic Integration - Because it has a uniform cell format, data from different sources can readily be integrated in ATM networks. Data can be transmitted concurrently, with this true form of traffic integration.

Network Simplicity - The ATM network is simplified in three ways: By taking advantage of lower bit error rates in optical fiber, errors are not monitored at network nodes; it is performed only at network boundary nodes or at the user end. Frame-delimiting functions are not necessary at network nodes. Routing is made simple by pre-allocating it for the entire fixed-path across the network.

Counterpoint - Due to a lack of feedback information, a problem in a data path may not be immediately recognized. As a result a congestion in a path that goes unnoticed for some time could possibly result in the loss of a large amount of data. Also, with the lack of error checking retransmission could be a result.

All in all, ATM has many benefits (and they outweigh the counterpoints) and we foresee numerous and rapid developments of ATM products and services. Evaluation of ATM technology is under scrutiny and is viewed by many as an attractive technology and will become a success with the development of new applications and the migration of existing applications into the network.

Using IRIS Explorer to Understand the NutraSweet Molecule

What is NutraSweet?

In today's world eating healthy to become healthy is something everyone is striving for in order to live a long and healthy life. The media constantly keeps us aware of the latest studies on nutritional issues such as your daily intake of salt, how eating certain types of vegetables prevents certain types of cancers, etc. Over the past decade an awareness of food substitutes for sugar and salt were derived for those persons who are trying to reduce their calories intake or who can not consume salt or sugar. One sugar substitute that has become popular to everyone which is NutraSweet.

NutraSweet or apartame along with the other artificial sweeteners belong with the amino acid group. There are at least 20 different groups of amino acids. Amino acids are the smaller components of proteins and are denoted by (COOH) which is carboxylic acid and (NH_2)which is the amino group. Aspartame is up to two times sweeter than table sugar. It is composed of aspartic, methyl ester of phenylalanine compounds. One important aspect of aspartame is that it is made of two amino acids therefore making it almost immune to any health problems.

There have been many test conducted on NutraSweet that have dealt with hyperactivity, memory loss, and behavioral changes. Aspartame has been linked to memory loss and the study covered a wide variety of people from pregnant women to diabetics. The outcome was negative since the evidence to back up this theory could not be substantiated. Hyperactivity was the cause of another study in which school and pre-school children were used. The theory was since sugar causes hyperactivity then aspartame would probably do the same. The results showed there was no relation between the two. Another study was conducted to test their behavioral changes however, with this study different tests were administered to the children. One was high in refined sugar, the second was low in sugar but contained aspartame, and the third was also low in sugar but contained saccharine. As with the other previous study discussed there was also no change noted in their behavior. The stability of NutraSweet was studied and under observation in conjunction with diary products. The results showed that the stability changed depending on its pH level, temperature, and buffer solution.

NutraSweet is marketed throughout the world by NutraSweet Company which is housed here in the US. They have recently decided to market L-aspartic acid and L-phenylalanine because synthetically they are building blocks for many pharmaceutical and cosmetic products. This will help boost the production of L-phenylalanine and aspartame therefore

producing its marketability. In 1992, NutraSweet prepared for its expiration of NutraSweet by reducing manufacturing costs by 70% and invested it to increase its production, they also negotiated with another company to establish another company in France. This type of business has allowed it to be the foremost food technology company in the US.

Aspartame has become a popular product throughout the food industry and to our diet. It has set the way for other artificial sweetener for the past. As we continue our quest for eating and living healthy, NutraSweet is one of the few chemicals that fits into this category.

System Administration Team
Weekly Report #4

Denisa Edwards, CV
Curtis Felton, CV
Kuchumbi Hayden, SA
Sharon Saunders, SA
Kevin Trotman, SA

The Networking team has been diligently working on finding more background information on the ATM networking. To understand the networking and telecommunication capabilities, several terms and questions are explained in this report. In addition to finding more background information on ATM, more pictures were developed to show how fiber will be pulled from building to building on campus. Photo pages will be included this report. The CV (Computer Visualization) team has concluded their investigation of the NutraSweet molecule on IRIS Explorer.

I. Definitions

CCITT

CCITT stands for Comite Consultaif Internationale de Telegraphique et Telephonique which now has a new name called ITU-T (International Telecommunications Union) ITU is the primary organization responsible for developing standards on the telephone and data communication systems among participating government. Two developments of standards by ITU are X.21 and X.25. ITU has levels of membership. First level has membership in the United States which comes from the State Department. Second level of membership covers private carriers such as AT&T and GTE. Third level deals with the industrial and scientific organizations. Fourth levels involves the international organizations. Finally, the fifth level works with the organizations in others fields that are interested in ITU's work.

ISDN (Integrated Services Digital Networks)

Integrated Services Digital Networks (ISDN) provides end-to-end digital network to support a wide range of user services (audio with a limited set of user-network interfaces). ITU uses the I series recommendation for dealing with ISDN matters. ISDN standard interface was defined and called basic access with a 64 kbit/s B channel and 16 kbit/s signalling D channel. Primary rate access has a gross bit of approximately 15 kbit/s or 2 Mbit/s offering flexibility to allocate high-speed H channels or mixtures of B and H channels and a 64 kbit/s signalling channel. The intent of ISDN is to use one technology to service all disparate systems. Integrated Services Digital Networks basic structure has functional groups to support a user access arrangement, reference points to divide functional group and interfaces, and access points to establish which International Standards Organization (ISO) layer entities are used at the functional groups or reference points.

Synchronous vs. Asynchronous Transfer Mode

Asynchronous Transfer Mode (ATM) is the transfer mode for implementing B-ISDN. The term transfer comprises both transmission and switching aspects. Transfer mode is a specific way of transmitting and switching information in a network. Asynchronous in transfer mode refers to the cells allocated to the same connection which may exhibit an irregular recurrence pattern as they are filled according to the actual demand. Synchronous Transfer Mode (STM) involves a data unit associated with a given channel identified by its position in the transmission frame. Whereas ATM, a data unit or cell associated with a specific virtual channel may occur at any position. ATM will allow total flexibility and

efficiency to be achieved in high-speed, multi-service, and multimedia networks. On the other hand, STM flexibility of bit rate allocation is restricted as it uses predefined channel bit rates.

B-ISDN

B-ISDN (Broadband -Integrated Digital Services Network) is the transport vehicle for ATM. Broadband is a service or system needing transmission channels capable of supporting rates greater than the primary rate. B-ISDN adds new high-speed channels to the existing channel spectrum, defines broadband user-network interfaces, and modifies the existing 64 kbit/s ISDN protocols. B-ISDN is suitable for both business and residential customers. B-ISDN will support services with both constant and variable bit rates, data, voice, and picture service components. B-ISDN is the provision of high-speed data links with flexible bit rate allocation for customer networking interconnection. As far as business, B-ISDN will improve current situations and allow videoconferencing to become a widespread telecommunication tool. The residential B-ISDN user will appreciate the combination of text, graphics, sound, still images and films for personal use.

II. Short Answer

What are the foreseeable broadband applications? (residential and businesses)

Broadband is a system requiring transmission channels capable of supporting rates greater than the primary rate. This principle of B-ISDN should be suitable for business and residential customers. Videoconferencing and high speed data links are the components involved in the business area. Videoconferencing, even though it is not widely

used, involves the rapid exchange information between people. This may currently improve the present situation by allowing videoconferencing to become a widespread telecommunication tool. The provision of high speed data links, which is another feature of B-ISDN, includes flexible bit rate allocation for the interconnection of customer networks. The residential user of B-ISDN will appreciate some of its features such as: graphics, sounds, still images and films that will inform you about recreational activities.

An explanation about the following diagram.

Figure 3.1 *ATM cell structure*

In ATM, the transferred information is packed into fixed-sized slots called cells. The cells contain a 48 octet information field and a 5 octet header. The information field is available for the user while the header field carries information that pertains to the ATM layer functionality. ATM uses the label inside each cell header to define and recognize individual communications.

Tables 2.1, 2.2, 2.3, 2.4 and 2.5 (based on [103]) give an overview of possible broadband services and applications as presented by ITU-T.

Table 2.1: *Messaging services*

Type of information	Examples of broadband services	Applications
Moving pictures (video) and sound	Video mail service	Electronic mailbox service for the transfer of moving pictures and accompanying sound
Document	Document mail service	Electronic mailbox service for mixed documents[1]

[1] Mixed document means that a document may contain text, graphics, still and moving picture information as well as voice annotations.

Table 2.2: *Retrieval services*

Type of information	Examples of broadband services	Applications
Text, data, graphics, sound, still images, moving pictures	Broadband videotex	• Videotex including moving pictures • Remote education and training • Telesoftware • Tele-shopping • Tele-advertising • News retrieval
	Video retrieval service	• Entertainment purposes • Remote education and training
	High-resolution image retrieval service	• Entertainment purposes • Remote education and training • Professional image communications • Medical image communications
	Document retrieval service	Mixed documents[1] retrieval from information centres, archives, etc.
	Data retrieval service	Telesoftware

[1] Mixed document means that a document may contain text, graphics, still and moving picture information as well as voice annotations.

Table 2.3: *Conversational services*

Type of information	Examples of broadband services	Applications
Moving pictures and sound	Broadband videotelephony	Communication for the transfer of voice (sound), moving pictures, and video-scanned still images and documents between two locations (person-to-person) • Tele-education • Tele-shopping • Tele-advertising
	Broadband videoconference	Multipoint communication for the transfer of voice (sound), moving pictures, and video-scanned still images and documents between two or more locations (person-to-group, group-to-group) • Tele-education • Business conference • Tele-advertising
	Video-surveillance	• Building security • Traffic monitoring
	Video/audio information transmission service	• TV signal transfer • Video/audio dialogue • Contribution of information
Sound	Multiple sound-programme signals	• Multilingual commentary channels • Multiple programme transfers
Data	High-speed unrestricted digital information transmission service	• High-speed data transfer – LAN interconnection – MAN interconnection – Computer-computer interconnection • Transfer of video information • Transfer of other information types • Still image transfer • Multi-site interactive computer aided design • Multi-site interactive computer aided manufacturing
	High-volume file transfer service	• Data file transfer
	High-speed teleaction	• Real-time control • Telemetry • Alarms
Document	High-speed telefax	User-to-user transfer of text, images, drawings, etc.
	High-resolution image communication service	• Professional images • Medical images • Remote games
	Document communication service	User-to-user transfer of mixed documents[1]

[1] Mixed document means that a document may contain text, graphics, still and moving picture information as well as voice annotations.

Table 2.4: *Distribution services without user-individual presentation control*

Type of information	Examples of broadband services	Applications
Data	High-speed unrestricted digital information distribution service	• Distribution of unrestricted data
Text, graphics, still images	Document distribution service	• Electronic newspaper • Electronic publishing
Moving pictures and sound	Video information distribution service	• Distribution of video/audio signals
Video	Existing quality TV distribution service (NTSC, PAL, SECAM)	TV programme distribution
	Extended quality TV distribution service • Enhanced definition TV distribution service • High-quality TV	TV programme distribution
	High-definition TV distribution service	TV programme distribution
	PayTV (pay-per-view, pay-per-channel)	TV programme distribution

Table 2.5: *Distribution services with user-individual presentation control*

Type of information	Examples of broadband services	Applications
Text, graphics, sound, still images	Full channel broadcast videography	• Remote education and training • Tele-advertising • News retrieval • Telesoftware

VRML: Virtual Reality Modeling Language

VRML, an acronym for Virtual Reality Modeling Language, allows a user to interact with the WWW in a 3-D environment. VRML uses the program WebSpace, WebForce, Intervista World View, VRweb, NCSA, Geomview, WIRL or VREAM to set up your workspace.

VRML depends on the limit of your imagination. Now VRML is a draft specification for adding 3-D data to the Web. Mark Pesce has been the VRML list moderator since it began. His vision has shaped much of VRML.

You might ask why put 3-D on the World Wide Web. Imagine yourself doing a report on the different theories on the assassination of John F. Kennedy. As you are searching you notice a 3-D viewing screen. You click the picture and miraculously you are in the scene of the assignation. You are able to walk around to see the placements and view points of the suspected gunmen. You might even be allowed to change the aim of the gun yourself. Interesting concept no? Well that is what VRML is. 3-D on the WWW enables a large variety of new applications and markets, such as: city planning, interactive previews of product catalogs, games, collaborative engineering, scientific publications, virtual reality, information visualization, and education. To achieve this variety of application and markets, you must have knowledge of obtaining this information your machine. For that you need either the program WebSpace, WebForce, Intervista World View, VRweb, NCSA, Geomview, Intervista World View, VRweb, NCSA, Geomview, WIRL ,VREAM WIRL or VREAM. For our purposes we will be exploring the program WebSpace.

WebSpace is the first commercially available 3-D viewer for the World Wide Web. Users can navigate to 3-D Web sites through conventional 2D page viewers or run WebSpace alone. WebSpace is a freely distributed product from Silicon Graphics Computer Systems and Template Graphics Software. WebSpace has an incredibly easy to use 3-D navigation interface that does not require special training or previous experience. The viewer adapts itself to the performance capabilities of the machine - from a PC (486) and Macintosh up to high-end workstations such as Suns.

WebSpace runs on PCs, at least (486) class machine. The navigation and visual experience on low-end machines will not be as complex, but nonetheless it is extremely fun and effective. Users on low-end machines will probably rely on guided-tour and point-and-click seek navigation rather than free roaming, due to the performance capabilities of today's personal computers. These techniques have proven to be just as appealing and effective.

WebSpace uses VRML to describe 3-D worlds. VRML is a platform-independent specification language for 3-D worlds on the Web. This language has support for a variety of features necessary to deliver a rich, interactive experience regardless of the platform. For example, the Level Of Detail feature provides multiple versions of objects so that authors can create low complexity to high complexity versions of their objects. This feature is used by the viewer to automatically choose the most appropriate level of detail for fast graphics performance. Another feature is the WWW Inline object that allows authors to build worlds in which the data defining the world is loaded only if the user gets close to it. The WWW Inline feature makes it possible to create infinitely scalable worlds.

Another feature that assist interactivity on low-end machines is the WWW Anchor and "# syntax" already supported in HTML documents. This allows 3-D worlds to have links to other worlds and documents. Authors can now create links to view points within a world, thus allowing guided tours within a world. The guided tour feature will allow users to navigate through 3-D worlds without having to "fly" this results in dramatically fewer redraws. Lastly, WebSpace has a point-and-click seek navigation function that gives users an intuitive interface for 3-D navigation. You point to a place in the world and WebSpace takes you there. Virtual Reality Modeling Language is a beneficial tool for interacting with the Internet overall in a three dimensional environment.

A Few Choice VRML Sites

WebCrawler Search

OZ VRML Worlds @ http://
3D Browsing with VRML @ http://
VRML Repository @ http://
The VRML Source @ http://

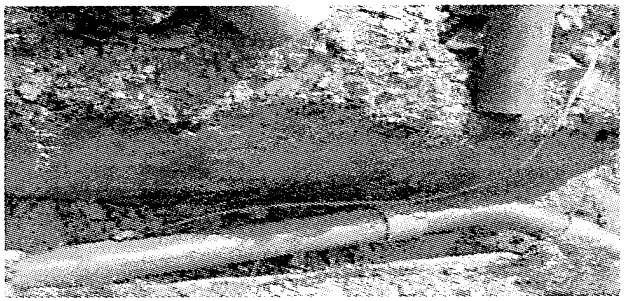
Silicon Graphics Search

Sample VRML Sites @ http://
VRML Ndes @ http://
WebSpace Home Page @ http://
WebSpace Application Scenarios and Visions @ http://

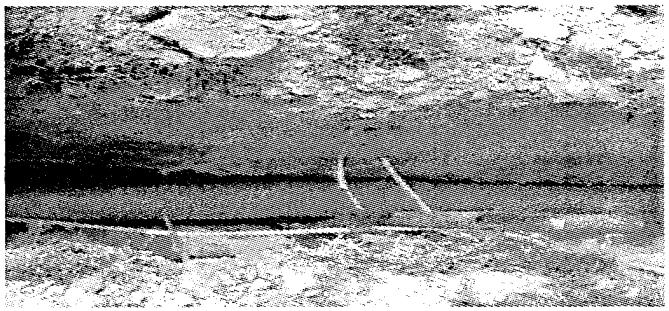
ATM Networking Team helps to lay down some 4"conduit PVC.

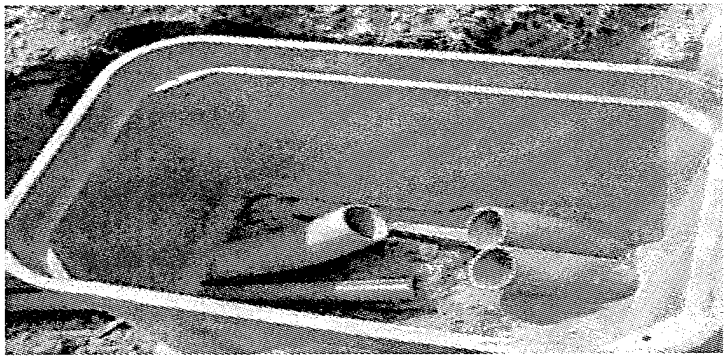
Kevin and Kuchumbi are checking out the contents of the plastic pull box.

Construction workers are making sure the conduit is connecting into the pull box.

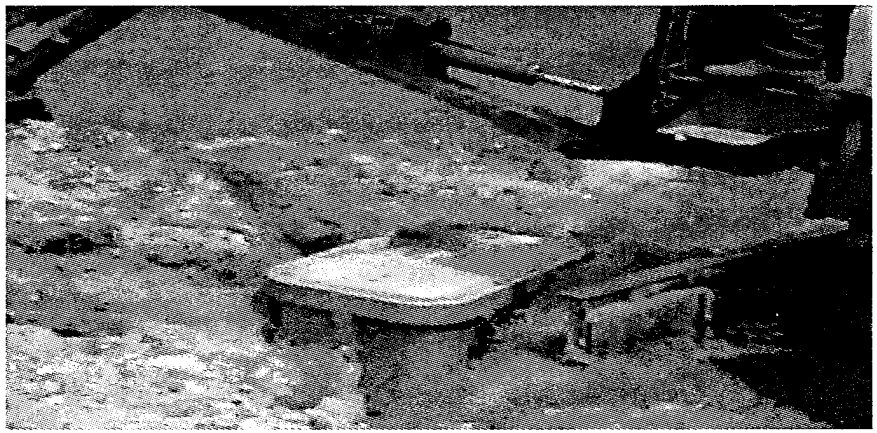


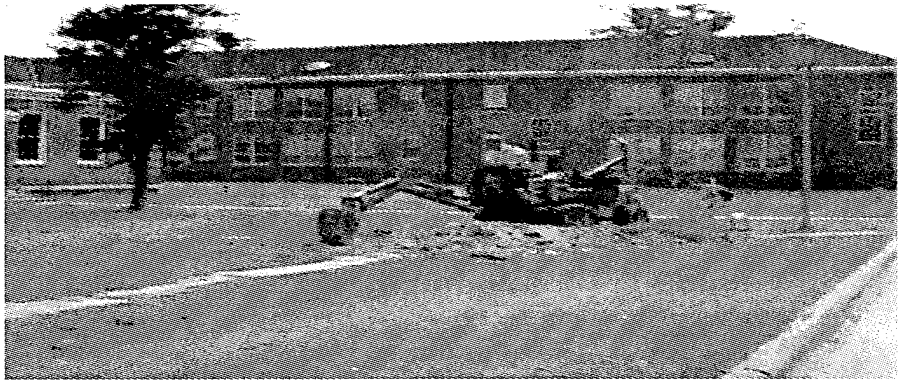
Conduit pipes laid in the ground to meet at an intersection in the pull box.
Below: Contents of the plastic pull box.

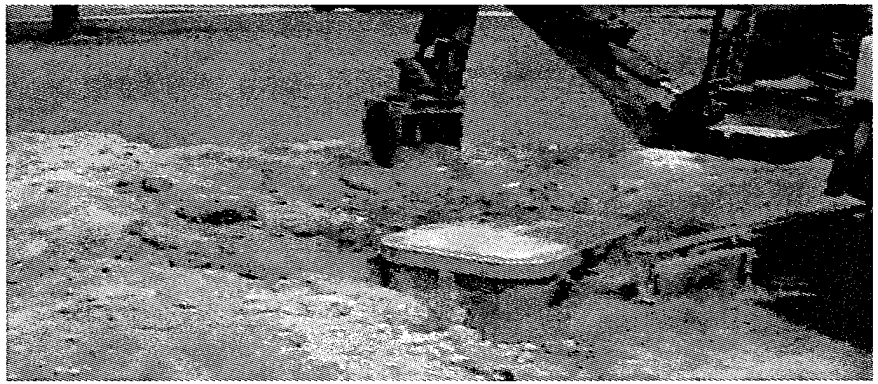




Once installed, dirt is packed around the pull box to secure the box in the ground.







Graphics-VR Team

ONR-AASERT SUMMER '95
VIRTUAL REALITY-GRAPHICS
WEEKLY REPORT #2

RenderMan is a program that can be used to create 3-D scenes and generate photorealistic images. There are certain steps that must be taken in order to maintain an efficient working environment.

Step 1 the user should log into a Sun workstation and start the open window.

Step 2 the user should open a "text editor" and at least two "shell windows". In one shell window, the user should log into sun1, for the RenderMan Tool kit is installed on Sun1 only.

Step 3 the user should start a xv in another shell window. XV allows the user to view different tiff files generated by Renderman.

After all this is done, it is best that the user save his/her work space to ensure that this process doesn't have to be replicated.

There are three steps to generate photorealistic images using RenderMan. They are as follows:

* Using the text editor to create a rib (RenderMan Interface Bytestream)file

* Using the "Render" command to convert a rib file to an image, usually saved as a tiff(Tagged image file format) file.

* Using XV to view the Tiff file generated by RenderMan.

A typical Rib file looks like the following:

```
1).  ##RenderMan Rib
2).  version 3.03
3).  Display "torus.tif" "file" "rgb
4).  Format 256 192 -1
5).  Projection "orthographic"
6).  ScreenWindow -2 2 -1.5 1.5
7.)  Identity
8.)  Rotate 120.000000 0.000000 0.000000 1.000000
9).  Rotate -35.264390 1.000000 0.000000 0.000000
10). Rotate 135.000000 0.000000 1.000000 0.000000
11). Translate -5.000000 -5.000000 -5.000000
12). WorldBegin
13). LightSource "distantlight" 1 "from " [5 5 5] "to [0 0 0]
14). LightSource "ambientlight" 2 "intensity" 0.2
15). Surface "plastic"
16). Color [0.2 0.4 0.8]
17). Torus 0.75 0.4 0 360 360
18). WorldEnd
```

Statement #1 is the comment which specifies the title of the program.

Statement #2 is the version of RenderMan begin used.

Statement #3 simply states that this rib file will be converted into a rgb color image saved as a tiff file with the name "torus.tif" if the render command is used.

Statement #12 through #18 from "WorldBegin" to "WorldEnd" is the description of the world which includes a torus and two light sources.

Statement #7 through #11 is equivalent to the placement of the camera. They define the transformation that converts objects from the world coordinate system to the camera coordinate system.

Statement #6 specifies the size of the film.

Statement #5 states the type of projection.

Statement #4 describe the size of the photo paper.

Transformation is a wonderfully complicated part of RenderMan. There are three layers to transformation. They are translation, scaling and rotation. Rotation can rotate an object on thetamax around any axis. Scaling makes an object larger or smaller. This is the same as if you enlarged a window on a Macintosh. Rotation and scaling are basically self explanatory but the kicker is translation. Translation moves object in RenderMan. This wouldn't be hard except the fact that the object has to be moved on three separate planes to place the object at the desired place.

We worked with all of the transformations in worksheet four. One of the main problems all of our group faced was translating, rotating and scaling each axis separately.

Constructive Solid Geometry is a technique which allows an object to be defined as a Boolean combination of other objects. CSG is similar to Boolean, in that the expressions used in Boolean relate directly to CSG commands. The CSG functions most used by our group this week are **union** and **difference**. **Union** relates directly to the Boolean expression **and**. This is said because **union** involves the connection of two or more objects to form one entity. **Difference** involves the subtraction of one shape or object from another. CSG is a building process, and like any construction process a blueprint is required in order to operate more efficiently while using the CSG technique. CSG is an incorporation of various shapes that are rotated and translated in order to obtain the desired results. Our group utilized the CSG method in completing numerous exercises given by our group's mentor Dr. Zhang.

In order to generate a photoRealistic image we need to place a camera, set the size of the film, and the size of the photo paper. To place a camera, it is necessary to identify a viewing point and viewing

direction. The viewing point is the point you would like to put the camera. The viewing direction is the direction you want to look to and it must be specified as a vector. To obtain a vector for the viewing direction , you subtract the viewing point from the point you want to look to. For example, if you want to look at the origin (0, 0, 0) and place the camera at the point (5, 5, 5) , then you enter -5 -5 -5 as your viewing direction. However, RenderMan does not take the viewing point and viewing direction directly. You need to convert them into transformations using a utility program and by putting these transformations before "WorldBegin".

Next it is necessary to set the size of the film. Just like a regular camera, objects outside the film will be cut using the technique known as clipping . To change the size of the film you have to go to the rib file and modify the the line starting with ScreenWindow. **ScreenWindow** is analogous to film. By changing the parameters following ScreenWindow you can adjust the film to any size.

Last, but not least, we need to set the size of the photo paper. To adjust the size of the photo paper you need to go the the rib file, and adjust the parameters following the **Format** statement. Of course, you need to save the changes and render it to create a modified tiff file. By following these simple instructions described above, you can take different pictures of the world defined by RenderMan.

The ***RGB (Red, Green, Blue) Color Model*** (for example, statement #16) is the combination of three visual pigment. This model is often represented as a unit cube, were as R, G, and B corresponds to the three different axes (x,y,z), and are assigned a value from 0 to 1. The rgb color model, like the xyz color system, can be added. Once the primary colors are added together, they produce other colors. Here are some examples of this. Black is represented as the origin (0,0,0), white as the vertex (1,1,1), and grey as the midpoint between the origin and the white vertex (0.5, 0.5, 0.5). The six other vertices included Yellow at (1,1,0), Red at (1, 0, 0), Magenta at (1, 0, 1), Blue at (0, 0, 1), Cyan at (0, 1, 1), and Green at (0, 1, 0).

Unlike some transparent colored surfaces, opaque objects send very little light from background objects. An example of opaque objects can be shown on the Power Macintosh's Virtual Reatily program. When selecting a door, for example, on this program, it gives the user not only what type

of door the user would want, but also how transparent the glass in the door was. If the door with an opaque glass was selected, the user

would notice that the viewer of the program could never look into it nor could they look out of it. Another example of an opaque object can be shown on the SunSparc machines using Renderman. While in Renderman, opacity varied from being transparent to being opaque. This is represented the same way the color is, (0, 0, 0) being completely transparent, (0.5, 0.5, 0.5) being completely transluscant, and (1, 1, 1) being completely opaque.

The RenderMan software package is very versatile because it allows the user to control the type of surface, by controlling the light sources. The first thing you need to know when talking about surfaces is the three types of refection. One type of reflection is **ambient reflection.** Ambient reflection is the name given to define the surface reflection of **ambient light.** The second type of reflection is **diffuse reflection.** Diffuse reflection is brightest for a light source directly above the surface. For example, if two people are sitting in a car, one on the drivers side and one on the passenger side, watching a movie they both see the same movie, even though they do not occupy the same position. The last type if reflection is **specular reflection.** Specular reflection is the mirror like reflection of a surface. Imagine the same two people at the movies. If they both look in the rear-view mirror, they do not see the same thing, this is an example of specular reflection.

The next thing you need to be familiar with is the four pre-defined surfaces. The first pre-defined surface is **constant.** Constant means that all of the colors look the same. There is no light, so the objects look the same. The next surface is **matte.** Matte uses **ambient** and **diffuse coefficients.** Another surface is **metal.** Metal uses **ambient** and **specular coefficients** along with **surface roughness.** The last surface is **plastic.** Plastic uses **ambient, diffuse,** and **specular coefficients** along with **surface roughness** and **specular color.**

The last aspect of surfaces is the texture map. The texture map allows the user to place the texture on the object if it is not a pre-defined surface. A texture map in the RenderMan Interface covers the unit square [0, 1]. By knowing the three basic aspects of surfaces, the user can effectively apply different textures.

Light sources is a function of RenderMan that allows the user to control the amount of light used in a computer generated environment. There are four types of light sources provided by RenderMan to generate different effects of lights. These light sources are ambient, distant, point, and spotlight.

Ambient light distributes light evenly through the computer

generated environment. Unlike the other light sources, ambient light delivers the same amount of light without regard to the surface's position and orientation. An ambient light source is comparable to light in the morning before sunrise.

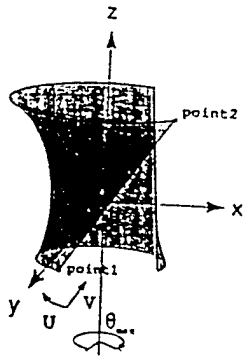
Distant light is different from ambient light, in that the light rolls consistently in space in one direction. Surfaces of the same orientation receives the same amount of light regardless of their positions, while surfaces of different orientation are illuminated differently. Distant light sources are comparable to the sun light.

A point light source distributes light through space from a single point in all directions. Light is spread evenly in all directions, however the intensity falls off with the square of the distance from the light to the surface. A point light source is comparable to a porch light during night time.

A spotlight light source stimulates a cone of light emitted from one point to another. A spotlight light source has both position and direction. The intensity of the light generated emitted falls off exponentially with angle from the center of the cone. This light source is comparable to the spotlight used during concerts and stage shows.

The animation of your designs is the final step in learning how to use RenderMan .

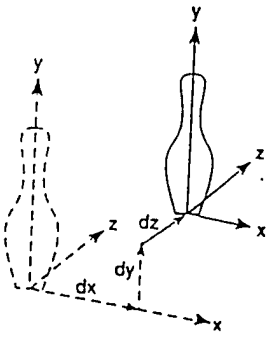
The first step in animation is the creation of a texture file (if you choose to have one). Secondly, the user should create pictures in the form of a tga file by editing his/her version of the rib file. For our demonstration we will show two toruses. The object of this demonstration was to rotate two toruses in 30 degree increments. This is done by simply changing your "rib" file, and then rendering it to generate a new "tori.tga" file. (The new abbreviation ".tga" goes along with XV 3.1 which is the newest version of XV.) After the creation of the desired amount of frames, the command "~rman/bin/anim tori" should be typed in the shell tool window . This will produce a file called "tori.fli." Last but not least, the user should type in "~rman/bin/xanim tori.fli." You will then be presented with your animated pictures. You can alternate between the left, right and middle buttons on the mouse to have the animation move forwards or backwards.



RIB BINDING

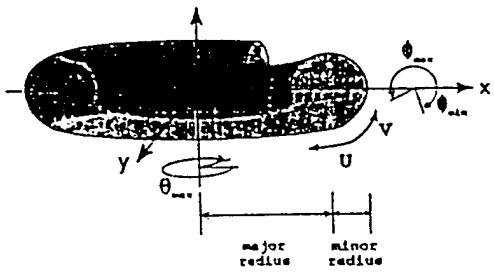
Hyperboloid $x_1\ y_1\ z_1\ x_2\ y_2\ z_2$ thetamax parameterlist

Hyperboloid [$x_1\ y_1\ z_1\ x_2\ y_2\ z_2$ thetamax] parameterlist



RIB BINDING

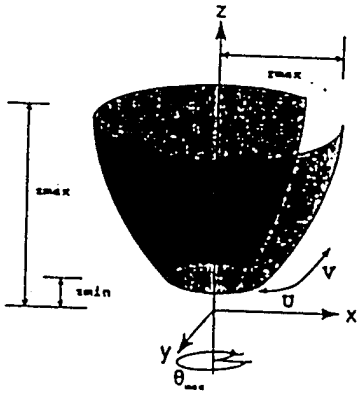
Translate dx dy dz



RIB BINDING

Torus rmajor rminor phimin phimax thetamax parameterlist

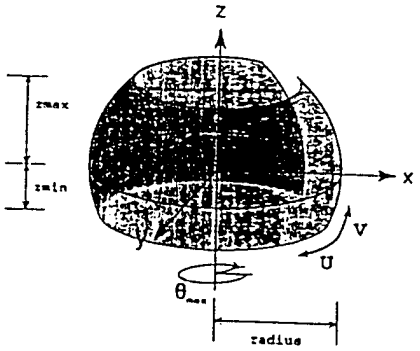
Torus [rmajor rminor phimin phimax thetamax] parameterlist



RIB BINDING

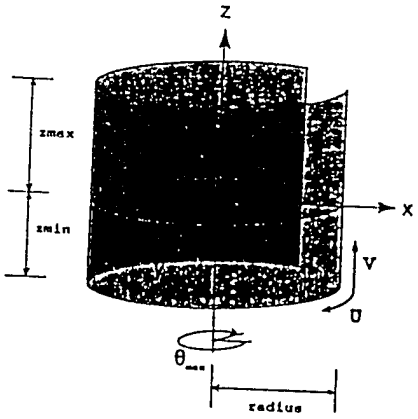
Paraboloid rmax zmin zmax thetamax parameterlist

Paraboloid [rmax zmin zmax thetamax] parameterlist



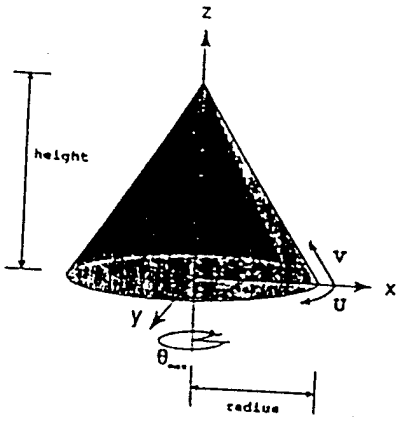
RIB BINDING

Sphere radius zmin zmax thetamax parameterlist
Sphere [radius zmin zmax thetamax] parameterlist



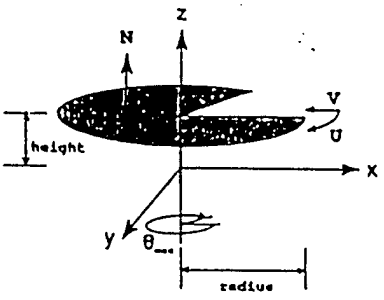
RIB BINDING

Cylinder radius zmin zmax thetamax parameterlist
Cylinder [radius zmin zmax thetamax] parameterlist



RIB BINDING

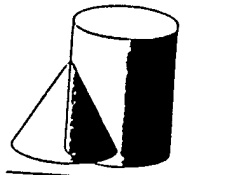
Cone height radius thetamax parameterlist
Cone [height radius thetamax] parameterlist



RIB BINDING

Disk height radius thetamax parameterlist
Disk [height radius thetamax] parameterlist

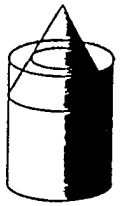
CSG — Difference

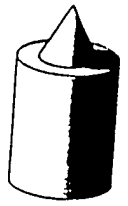


Cone and cylinder positioned for subtraction

Cone minus cylinder

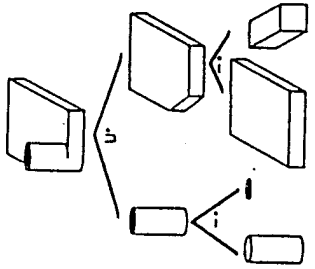
CSG — Union





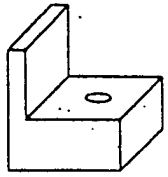
Union of cone and cylinder

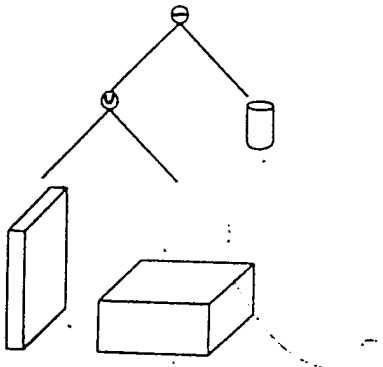
CSG Tree



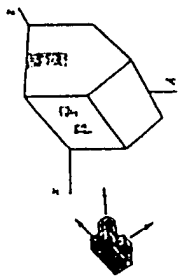
An object defined by CSG and its tree.

CSG (Constructive Solid Geometry)

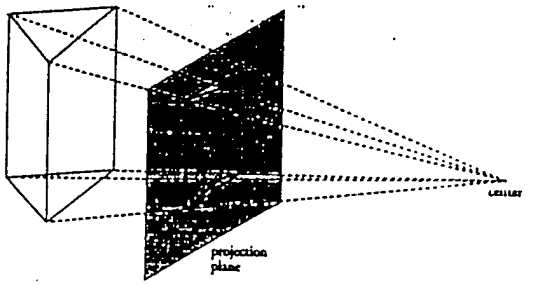




Viewing Transformation

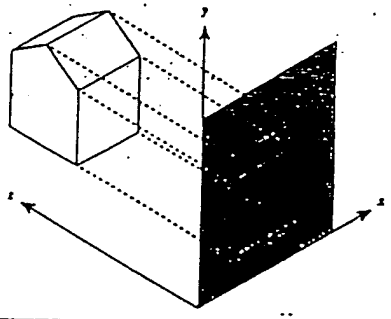


Projection Transformation
— perspective



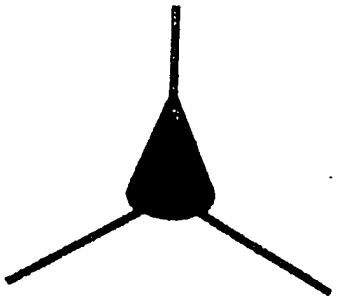
Spatial view of a perspective projection

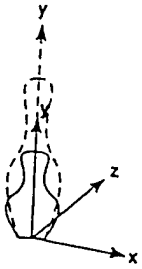
Projection Transformation
— orthographic



Orthographic projection

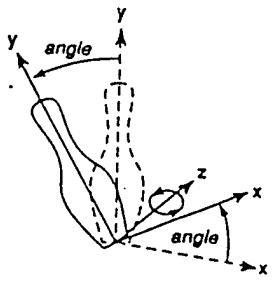
```
##Begin cone on X
TransformBegin
Translate 4.0 0 0
Rotate -90 0 1 0
Cone  3.0 1.0 360
Disk 0.0 1.0 360
TransformEnd

##Begin cone on Y
Color [1 0 1]
TransformBegin
Translate 0 4.0 0
Rotate 90 1 0 0
Cone  3.0 1.0 360
Disk 0.0 1.0 360
TransformEnd

##Begin cone on Z
Color [1 1 0]
TransformBegin
Translate 0 0 4.0
Rotate 180 0 1 0
Cone  3.0 1.0 360
Disk 0.0 1.0 360
TransformEnd
```





RIB BINDING

Scale sx sy sz

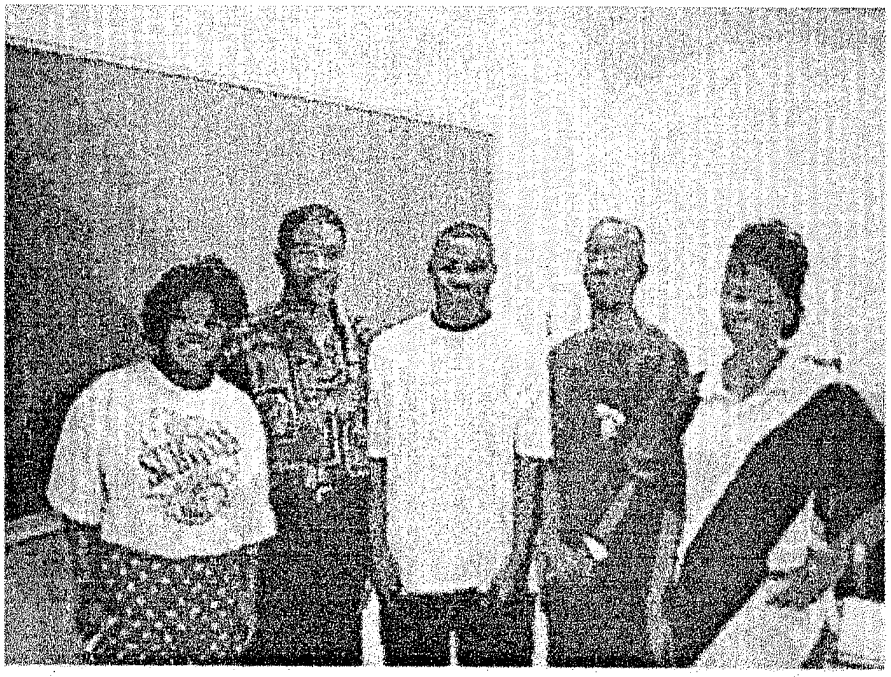


RIB BINDING

Rotate angle dx dy dz

Multimedia Team

Multimedia Team
Summer 1995



MULTIMEDIA AUTHORING TEAM
WEEKLY REPORT
July 17 -July 21

Multimedia Work

This week the Multimedia Authoring Team has been very busy working toward our final project. Everyday this week, we met over in the Academic Computing Center with Mr. Wilkins. We spent Monday learning how to operate video in Persuasion. However, problems did occur. We spent a great portion of time figuring out why our video monitor would not function correctly. We were only able to have one small monitor, and when trying to enlarge it, we lost our monitor completely. We eventually solved our problem, by calling Apple Technical Support. The technician informed us that the image was trying to be sent to a larger monitor. This, however, could not be done because we did not have a larger monitor connected to the AV card.

Tuesday morning Mr. Wilkins allowed us to continue what we had started on Monday. We saw the video on the computer, and we were able to take pictures of video frames. He also discussed the possibilities of scanning for parts of our presentation.

Wednesday we met with Mr. Wilkins in the afternoon. He sent us to our workstation. We began scanning brochures on the dismal swamp and collecting pictures from a presentation on the wetland area and Dismal Swamp Boardwalk project given by Dr. Powers. This will be implemented into our final report.

Thursday morning we interview Dr. Ron Blackmon and Dr. Gary Harmon Concerning biotechnology at ECSU. They gave a general overview of the Biotechnology at ECSU. They gave a general overview of the Biotechnology field, and then they described the Biotech program at ECSU. The recorded interview will be transcribed and the text will be used with the pictures to create an electronic presentation. After the interview, we attempted to connect our computer, VCR, and TV together in order to record and run computer images on the TV.

Friday we spent the morning finalizing our presentation. That afternoon we viewed the other teams presentations and gave ours.

Lectures and Classroom

Aside from MMA work the members of the team were involved with many educational lectures and classroom teachings. On Monday morning Dr. Morell taught us Parallel Processing. Parallel Processing is the use of more than one processor to solve a single problem. To show how parallel processing works, Dr. Morell gave us an activity on workinbg together in groups by packing pennies in the wrapper the fastest.

Tuesday afternoon we attended a workshop given by Sharon Saunders. It concerned UNIX and some of the commands that we went over last Tuesday with Dr. Hayden. She also taught two new commands. They were pipe and tee. Pipe is when the output of one process becomes the input of another. Tee is when you can write text to a file while simultaneously displaying on a video screen. After learning these commands, we practiced them on the computer.

Wednesday we met with Dr. Morell. We learned about the differnece between concurrent processing and parallel processing. However there really isn't a difference. Both occur at the same time but by different processes. He also taught us about the shell and process which is a running program, pipelines which is the output of one command formed into the input of the next command, and remote shells which are executing a shell onto a remote machine and passing the command to that shell. Finally, we did the pennies activity over by using a different method, which was speed, communication, and multiple tasks.

Thursday afternoon we were lectured to by Dr. Zhang on Virtus VR. We learned about how to operate Virtus VR, and what some of the windows and symbols represented. After the lecture, Je'aime Powell showed us how to create a simple house, by its width, height, and by angles.

Chapter Quiz
Chapters 1-3 Aldus Persuasion
True/False

___ 1. The basic difference between a presentation and an AutoTemplate is the way they open.

___ 2. To delete an empty heading you must press Command + Tab.

___ 3. To add text to your presentation by way of tool defaults, you select the pointer tool.

___ 4. You can only enter the text for a presentation in Slide View.

___ 5. You can go back to working on the last saved version of your presentation at any time by using "Revert" from the File Menu.

___ 6. When you work on slides, you only work with tools.

___ 7. In Persuasion, you can only create slides by typing the text of your presentation in outline view.

___ 8. The "notes" of your presentation only appears on the first slide of your presentation.

___ 9. Once you have started your presentation, you may change its medium to fit your desired presentation.

___10. A slide text, subtitle, and body text are controlled (movable) only by the placeholder in the Master.

Short Answer Questions (write on back)

1. There are twelve Persuasion tools; name six of them. Sketch the corresponding icon.
2. You can type text directly onto slides. Name the two types of text you can add to slides. Describe briefly each of these two types.
3. What is meant by "Nesting Slides"? Sketch an example of Nesting Slides.
4. Identify the five types of headings in the Persuasion outline and briefly describe each.

Answers For Chapter 1 - 3 Aldus Persuasion
True/False & Short Answer

1. **True;** You can open a presentation in three ways; such as Open from the File Menu, New from the File Menu, and from Scratch. Whereas, an AutoTemplate is opened from a set of SlideMasters.
2. **False;** Command + Tab is a command for demoting a heading with the insertion point anywhere in it.
3. **False;** To type text in your presentation, you use the A tool which is for typing text.
4. **False;** You can enter text not only in Slide View, but also in Outline View.
5. **True;** In order to go back to the last saved version of your presentation, you can use "Revert" from the File Menu.
6. **False;** When you are working on slides, you use objects.
7. **False;** In Persuasion, you can create slides by typing or importing your presentation in Outline View.
8. **False;** The "notes" for your presentation nevers appears on your slide presentation.
9. **True;** When you start your presentation, you may change it's medium to fit the presentation.
10. **True;** The placeholder in the Master is used for moving a slide text, subtitle, and body text.

1. Text tool, pointer tool, perpendicular-line tool, diagonal-line tool, arc tool, magnifying (in and out), square corner tool, round corner tool, ellipse tool, free form tool, polygon tool.

2. Slide text and independent text

3. Nesting slides create an overview slide of each of its main points becoming the title of a separate slide.

4. Holder of slides - A heading that appears and is used only in Outline View.
   Slide title - A heading that generates an individual slide presentation.
   Subtitle - A heading that contains text for a subtitle on a slide.
   Slide text - A placeholder text on slide
   Notes - A heading that contains your notes for giving a presentation.

Biotechnology

Biotechnology is a new science or collection of technologies build on new studies of molecular biology which allows you to alter or manipulate biological organisms as selective breeding was done in the past. This process is not new to humans, in fact, it has been around for 15 to 20 thousand years. Modern biotechnlogy is simply a new way of doing various types of biological things using a molecular level, and instead of selective breeding, biotechnologist use organism that are important for certain characteristics and manipulate the molecules themselves. The possibilities for biotechnology are endless because occurring now is the ability to change organisms: plants; bacteria; animals, in a short amount of time using common genetic material like DNA (deoxyribonucleic acid) that is in all kinds of organisms. For example, if one is interesting in breeding large tomatoes, it can be done at a molecular level, or just by breeding plants that give you successfully larger tomatoes.

The interest of biotechnology at Elizabeth City State University is to train students in this kind of technology, primarily biological and chemical, that are involved in the same kinds of biological things. With this, a minor in biotechnology was established last May at the University. This 19 credit hour minor includes all of the fundamental technologies that students need to learn how to do in order to do biotechnological processes along with the manipulation of chemicals, biological processes, and data (which involves a computer course taught by Dr. Houston). This minor also includes an ethics course to make students understand the impact of the kinds of things that they are able to do. In a nutshell, the program is designed to give students a background in both theoretical and technical skills in manipulating macromolecule and changing organisms, and allow them a fair chance in qualifying for an entry-level position at a biotechnology company .

There are 80 biotechnological companies in North Carolina alone. North Carolina is one of the largest states in terms of theses companies. In terms of job growth, biotechnology is projected to be the largest area of job growth in North Carolina within the next 15 to 20 years.

Some of the biotechnological projects that students are exploring involve genetically engineering transgenic plants which allow them to

create new forms of plants whether it be for medical benefit, for food benefit, or for a different area. Other projects include the manipulation of DNA. Since this is a fairly new program, students are trained to clone genes and other techniques that can be seen illustrated on television, such as the Rflp type things with the O.J. Simpson case, in which they look at the DNA profile to analyze blood samples and tissues. The students are being exposed to some of the real current technology that is being seen all over the world.

With Dr. Blackmon's thought that the University should be a catalyst of change in northeastern North Carolina, the biotechnology department holds a long term goal of attracting a biotechnology company to northeastern North Carolina. This, in turn, would have colossal effects on the University and the economy.

The history of biotechnology at Elizabeth City State University began with the initial lectured course of molecular biology that didn't have a laboratory. The next year Dr. Blackmon received money from the Howard Hues foundation to run a small laboratory for a semester. Then in the following year in was offered the whole period. Now the course has basically been converted into a laboratory course. The evolutional process has been nice and interesting mainly because the students are exposed to a lot of different things and Dr. Blackmon uses this "hands on" experience to allow students the idea of "If I can do this, maybe I can try that."

In five years from now Dr. Harmon feels that the biotechnology program will be much more advanced than it is now because the program has not been around that long, and still, they have such a demand from students that they have some trouble holding the size of the classes down. They are now getting more equipment and more faculty members. In addition, next summer the department is running a program for public school teachers to train them in biotechnology so they can take what they learned back to the classroom to add excitement and spark interest.

***This is a transcript from the conversation the Multimedia Research Team had with Dr. Blackmon and Dr. Harmon.

MULTIMEDIA AUTHORING TEAM
WEEKLY REPORT
JULY 3, 1995 - JULY 7, 1995

LAKISHA MUNDON
COURTNEY FIELDS
CONNIE SAWYER
DERREK BURRUS

MONDAY JULY 3

Today, we learned C++ by Dr. Morell. His presentation was basically explaining to us what is programming and the different features of Object-Oriented Development. These features are Abstraction, Encapsulation, Inheritance, and Polymorphism. There was also an play to help us learn the advantages of these features. Our instructor next was Mr. Derrick Wilkins. First, we introduced ourselves and then we went into depth as to what is Multimedia? Multimedia is the integration of text, sound(music, voice), graphics, animation, and video on the computer. Next, we went over Aldus Persuasion, this is a presentation package that can be expressed electronically on slides on the computer. Next, we went to the Academic Computing Lab and reviewed a couple of things on the computer. Finally, we had a activity on this program so that we can familiarize ourselves with it.

TUESDAY JULY 4

No work today, Independence Day.

WEDNESDAY JULY 5

This morning, we had another assignment on C++ by Dr. Morell. We modified our program to a fixed percentage increase of our dollars and cents. Next, we had training by Mr. Wilkins on Auto templates, Views

(side and outline), and a Tool Bar. Afterwards, we looked at a presentation form, we created a presentation in outline view, we created folders to keep our work in, we spellchecked the presentation, we learned how to save and open presentations, and we also looked at transition effects.

THURSDAY JULY 6

Today, Mr. Wilkins gave us a lecture on Persuasion. We learned the five types of headings in the Persuasion outline. They are Holder of slides, Slide title, Subtitle, Slide text, and Notes. We also learned about Background and Master. Next, we learned about AutoTemplates. We created a template by choosing our own colors and pattern. Then, we learned about Borders, how we can make it blend into our slides. Finally, we had a presentation and lecture by Dr. Zhang. His lecture was about Transformation Pipeline. There are three sets of operations - union, intersection, and difference. We also learned about 3D Graphics Packages and Output Primitives.

FRIDAY JULY 7

Today, we did our reports on what we learned as a group. We presented it to everyone in the program. Finally, this is what we have complied together for MMA.

MULTIMEDIA AUTHORING TEAM
WEEKLY REPORT
July 10 - July 14

Derrek Burrus
Kisha Mundon
Courtney Fields
Connie Sawyer

Multimedia Work

This week the Multimedia Authoring Team has been very busy exploring the world of multimedia through Aldus Persuasion; with the assistance of Mr. Wilkins our advisor. He lectured us Monday on planning effective presentations. This basically informed us how to motivate, inform, and inspire the audience (see last two pages). We also learned the guidelines for planning effective presentations. This was mainly about using language your audience will understand. The main point stressed was not to try to impress people with how much you know and not to put a lot of information on one slide. We also were given copies of chapters one and two from the Aldus Persuasion Manual and assigned with reviewing them and coming up with true/false questions and discussion questions from each of the chapters.

Tuesday morning Mr. Wilkins was unable to assist us due to a meeting he had to attend. However the team stayed on task. We received a copy of chapter three from the Aldus Persuasion Manual. Like the other chapters we had to create true/false and discussion questions. Mr. Wilkins also left us an article entitled "Entry-Level Multimedia Authoring Tools For Education". We were asked to review the article and write a two page summary. He also wanted us to think of ideas of how to include the summary in our Friday presentation.

Wednesday we met with Mr. Wilkins in the afternoon. He reviewed and critiqued our questions we derived from chapters one, two, and three of the Manual. He also discussed with us the main concepts of article he assigned to us. After the conversation we entered the lab and worked more with Persuasion. By the end of the session, we were able to efficiently use layers and implement transitions into projects.

Thursday we met with Mr. Wilkins in the morning. He reviewed our article summary and gave suggestions to improve it. We also completed our revised true/false and discussion questions test. We spent the

majority of the morning working on sample presentations and brainstorming for ideas and major points to include in our Friday presentation.

Friday we spent the morning finalizing our presentation. That afternoon we viewed the other teams' presentation and gave ours'.

Lectures and Classroom

Aside from MMA work the members of the team were involved with many educational lectures and classroom teachings. On Monday morning Dr. Morell taught us an easier way to define the Display Class from using inheritance and modification. This was explained by simply, defining the attributes and the methods of a class without incorporating the definition from any other class. He also taught us about the three possible modifications which were Add, Delete, and Change.

Tuesday afternoon we sat in on a workshop with Dr. Hayden. It concerned UNIX and some of the commands used with files, such as how to create and remove a directory. The three types of files we learned about were, directory, ordinary, and special. Directory is a file that contains the name of other files. Ordinary is a file that contains text, data, or programs. Special is a file that represents a particular hardware device. The commands we learned were mk dir - this means to make a directory, cd - change a directory, cp - copy a file, rm dir - remove a directory, mv - move a file, chmod - change mode command for permissions, cat - how to display a file in Unix, ls - list directories, pwd - print the working directories, ln - link the files together, cd.. - change directory to a parent directory. We also learned how to give permission to our files. After learning these commands, we practiced them on the computer.

Wednesday we expected to meet with Dr. Morell. However he wanted to concentrate with the OOPS group, so this gave our group time to work together.

Thursday afternoon we were lectured by Dr. Zhang on RenderMan. We learned about how to operate RenderMan, and what some of the terminology meant. After the lecture, we entered the lab and practiced what we had learned.

The next pages contain the summary of the article we reviewed and the handouts we received on planning an effective presentation and the guidelines to follow.

ENTRY-LEVEL MULTIMEDIA AUTHORING TOOLS FOR EDUCATION
Article Summary

In the past, educators and others interested in computers have desired to use multimedia authoring programs, but lacked the training to use mainstream tools such as Director, Authorizer, SuperCard, and ToolBook. This article discusses entry-level multimedia authoring tools, and five programs that implement them. Each of the programs meet different sets of needs for its authors. One main feature of all of them is how the slide show is created. Where some known multimedia programs use the slide show flowline metaphor, such as Authorware, these packages use the slide show metaphor. This means the slide show is created directly on the slide. This article highlights the main points of all of the programs, and instead of giving the reader one choice as the best package, it leaves one to decide which could be best for their needs.

The first package discussed in this article is **Action!1.04**. This package was created by Macromedia for the Macintosh, and it is primarily designed as a media integrator. By calling Action! a media integrator, the author states it allows the user to easily combine text, graphics, animation, sound, and video. One main feature of **Action!** is that it can be used as a supplement to less media-oriented programs, namely Persuasion and PowerPoint. Presentations from Persuasion and PowerPoint can imported to **Action!**, however, they can only be imported one slide at a time. The author concludes **Action!** is a package best suited to users having a firm hold on Persuasion or PowerPoint techniques, but need more animation and multimedia capabilities to their presentations.

Astound is the second package discussed in the article. It was created by Gold Disk, and it comes in two versions. **Astound 1.01** for Macintosh and **Astound 2.0** for Windows. A strong feature of **Astound** is that it offers many multimedia capabilities without the complexity of scripting. With these features **Astound** is not really an entry-level multimedia tool, but can serve as one. The very, very large program can also be used with programs such as PowerPoint and Persuasion. Using **Astound** can make the creation of large multimedia presentations easy. In fact, in a single step, Persuasion and PowerPoint slide shows can be imported directly into **Astound** presentations. **Astound** for both Macintosh and Windows are very easy to use, but also very powerful.

Digital Chisel 1.2 for Macintosh, another program is targeted at the young audience. It is said to be ideal for children from Kindergarten to twelfth grade. This program is the only entry-level multimedia authoring tool that may be easily used by students

who are in grade school. Due to the targeted audience the program contains no complex features therefor it is not recommended for university professors or students.

mPower 2.01 PPC is the fourth package discussed in this article. This program is targeted for educators. **mPower 2.01 PPC** is also unique because all of your assembly work is done by pushing buttons. (Example: An ATM Machine which is easy to work, is used only by controlling buttons). Another unique feature is that the program can control a variety of videodisk and VCRs by allowing you to integrate video from tape or videodisk into your program.

The last package discussed in this article is **Special Delivery 2.0** for Macintosh. **Special Delivery 2.0** is targeted at computer programmers and demonstration developers. One main feature of this package is that you can have your speaker notes visible on one screen, while the audience only sees the main presentation on the other screen. Another unique feature is that it is easy to create self-running demonstrations. According to the research, **Special Delivery 2.0** may be one of the most attractive of the five packages.

After our research, we concluded that there could not be one application labeled as the best. When choosing one of these programs, it is good to keep in mind that they are aimed at different audiences.. Therefore, before making a choice, one should take into consideration the skill level of the developer; the need to integrate with other programs; and the sophistication level of the package. For example, if you were giving a presentation to college students you would not use Digital Chisel. It is also good to recognize that these applications contain special features good for only certain kinds of presentations. If you wanted a presentation with a large amount of animations. You must ask yourself what are my required features and who am I going to present it to. Although different in many ways, these programs all contain the slide show metaphor. In any case, when deciding to make presentations using multimedia keep these programs in mind; they are well recommended.

Planning Effective Presentations

Defining Your Purpose:

Motivation: You want people in your audience to be motivated to do something, such as vote for a particular candidate or buy a product.

Information: You intend to convey some knowledge to your audience.

Inspiration: Your aim is to get your audience to believe in something, such as religious or political philosophy.

You should decide on which purpose is the most important purpose and focus on that purpose. Bring up the others only when they support your main goal.

Deciding What To Include:

In planning your presentation, make sure that every item of information you provide is likely to help people come to the decision you want. Do not include information just because you expect the audience to find it interesting or because it is something you are proud of.

Choosing Your Medium:

1. Flip charts: separate sheets of paper hinged on one edge, each containing a step of the presentation

2. On-Screen presentations: a series of images presented on a computer screen

3. overhead transparencies
4. 35mm slides
5. video tapes or films

Guidelines For Planning Effective Presentations

•Show one new idea on a slide: Limit the amount of information on each slide. Do not present a whole list of key words.

•Have the right number of slides: Maximize the number of slides with the amount of time for presentation.

•Minimize the number of words you use and set them in large type: By minimizing the number of words, you can make sure your text is large and easy to read.

•Have a consistent graphic theme: Choose a basic design and color scheme.

•Simplify the graphics and avoid decoration: Each graphic should be simple and large so that your audience can readily see and understand it.

•Show numeric data graphically: If your presentation consist of financial information, use graphs and charts.

•Do not overuse your company logo.

•Use pictures and drawings as much as possible: Your audience may find the presentation more interesting and informative if you illustrate your data.

•Match image to your spoken words: The image on the screen should always complement your spoken words, just as your spoken words should complement the image.

•Use language your audience understands: The words you use in your slides and while speaking must be familiar to the audience.

MULTIMEDIA AUTHORING TEAM
WEEKLY REPORT
July 24 - July 28

Derrek Burrus
Kisha Mundon
Courtney Fields
Connie Sawyer

Multimedia Work

This week the Multimedia Authoring Team has continued working hard to complete their final project. We continued to meet with Mr. Wilkins everyday in the Academic Computing Center. On Monday we spent the afternoon installing Cinemation. Cinemation is an electronic package that will allow us to add animation to our presentation. The reason for choosing Cinemation was that the graphics and animation can be imported into Aldus Persuasion. After installing Cinemation we went through the tutorial that came with the package, so that we could become familar with the package. Afterwards, we were able to create a ball and have it bounce across the screen making a bouncing sound as it went along.

Tuesday morning we installed Aldus Persuasion 3.0 and Microsoft Works 3.0 to our workstation. Some of the features we found while exploring the 3.0 version were: a fade transition; a larger color palette; and a more enhanced slide master. In addition, we were able to use a feature called autoanimation witch allowed words to travel on and across the screen. For the past three weeks we have been working with Persuasion 2.1 but the 3.0 version offers more features. In our quest to have a very successful and interesting project we decided that we wanted the most updated version to insure that our project reached its full potential. After installing the 3.0 version we found that included some of the features we were looking for in Cinemation. We decided to delete Cinemation from our project. Microsoft Works was installed at our workstation to enable us to process our weekly reports at the Acdemic Computing Center as well as Lester Hall.

Wednesday we met with Mr. Wilkins in the afternoon. We came up with a written synopsis for our final project. Our project involves making a presentation discussing the Biotech program and the Dismal Swamp Project at Elizabeth City State University. We began working on our final project. We designed the AutoTemplate that we would be used in the presentation. We also captured pictures from a video giving information on the Biotech Program.

Thursday afternoon we continued working on our final project. We imported text onto the outline and pictures from the Biotech video. We started adding transitions and autoanimation to the text. We also explored a software called Cinema CD. From this CD we were able to import video into Persuasion. We completed fourteen slides of the Biotech portion of the project.

Friday we spent the morning creating a weekly report. We decided to take the presentation we made last week on Persuasion 2.1 and imported it into 3.0. This allowed us add more features. That afternoon we viewed the other teams' presentation and gave ours'.

Lectures and Classroom

Aside from the everyday MultiMedia applications the MMA team has been involved in some other important activities. On Monday morning the team set up two sites for the Board of Governors to view. One was an old presentation using Authorware. This presentation was shown on the Power Mac 8100. The other was a sample presentation made with Aldus Persuasion 2.1 on the Macintosh LC.

Tuesday and Wednesday we explored the site http://www.eworld.com. This was assigned to us by Dr. Hayden. A summary of this site is included on the next page. Since we did not have other instructors aside from Mr Wilkins, we took time to make corrections on our previous weekly reports so they could be readmitted to Dr. Hayden. On Wednesday we also assisted in the unloading of the new SGI machines.

Chapter Quiz
Chapters 4-5 Aldus Persuasion
True/False

____ 1. The two types of charts in Persuasion are placeholder charts and independent charts.

____ 2. The rules for moving or resizing an object also applies to charts and tables.

____ 3. Before creating a chart, one must first analyze the data to be placed on a chart.

____ 4. There is a standard font, size, and style for text added to charts, that can not be modified.

____ 5. After you change the data sheet, you will need to replot the chart.

____ 6. Persuasion has less than 100 basic colors to choose from.

____ 7. You can apply color to only the text that has been selected.

____ 8. When adding color to Persuasion presentations, you can only change the color of the background: you can not change the color of your text.

____ 9. You can edit the working station (your presentation) by replacing a color, removing a color, or adding new color to your workstation.

____ 10. Although you can manipulate each imported color graphic as a unit (for example, move or resize), you cannot change the colors imported with the graphic nor edit the individual parts.

Short Answer Questions (write answers on back)

1. Using Persuasion "Paste" and "Import..." commands, you can work with color graphic created in other applications. Persuasion imports color graphics saved in two formats. name these two formats.

2. You can apply colors in 5 different ways, one of which is to "line color ", which allows your text to be lined or trimmed in a specific color. Another way is to "fill Background. Name the other 3 ways that color can be applied to the presentation.

3. Name 5 standard graphs/charts that can be used in a presentation. For example, pie graphs, bar graphs, etc.

Answers for Chapter 4-5 Aldus Persuasion

1. T
2. T
3. T
4. F
5. T
6. F
7. T
8. F
9. T
10. T

Short Answer Questions

1. PICT II/Encapsulated PostScript(EPS)
2. Fill color, Shadow color, line background, fill background
3. Stacked bar, column, line, area, scattered, table

eWorld

eWorld is Apple's on-line service. It's the only place where you can get direct on-line computer support from Apple. It's conveniently accessible to Internet, and it's also easy to use by everyone. eWorld uses the town square metaphor. The town square metaphor is used to lead people around to specific information. eWorld has many different types of buildings and each building is aimed to a different set of users, such as, business people, educators, entertainers, etc.

eWorld is accessible anywhere in the world, and can be used for ten free trial hours. But afterwards, billing is $8.95 per month for four hours usage. This also includes free internet access and direct online Apple support. eWorld runs on the Macintosh computer, and later this year a version for Windows will be coming out.

Statistics for eWorld Minimum Requirements:

Macintosh Computer

Running Mac OS 6.0.7.

4 MB Ram

5 MB Hard Drive

2400 baud Modem

Speed up to 14.4 kbps.

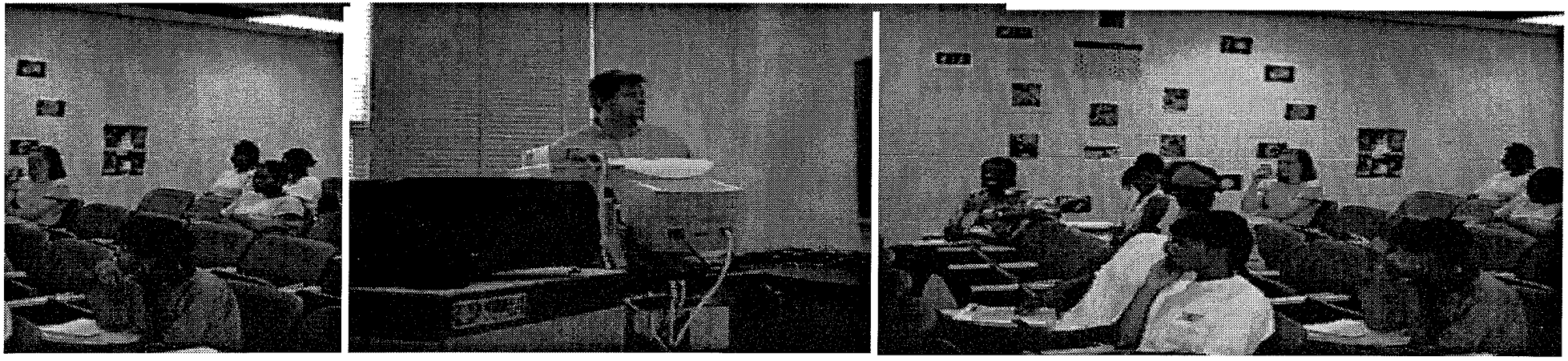
The purpose of eWorld on the Internet is to introduce interested users to eWorld and gives them information on purchasing the system.

Thursday morning we attended a demonstration workshop given by Doug Brooks and Jeff Lloyd, Apple Computers representatives. The presentation introduced QuickTime VR, a software application used on the power Macintosh (the VR stands for Virtural Reality, a concept which allows the researcher to explore a spatial environment on the computer). This software package allows the user to explore scenery and make a high quality on a video screen. For instance, one of our fellow researchers created a short movie highlighting the campus, and Mr. Brooks was able to manipulate this movie in such a way that we able to see an entire 360 degree view of the building. This Panoramic creation is done by 1) Planing the scene 2) Photographing the scene with an 30 percent overlapping; and 3) Stitching the scences together. The representatives also gave us the site in which to fine QuickTime VR's homepage: **http://quicktime.apple.com**.

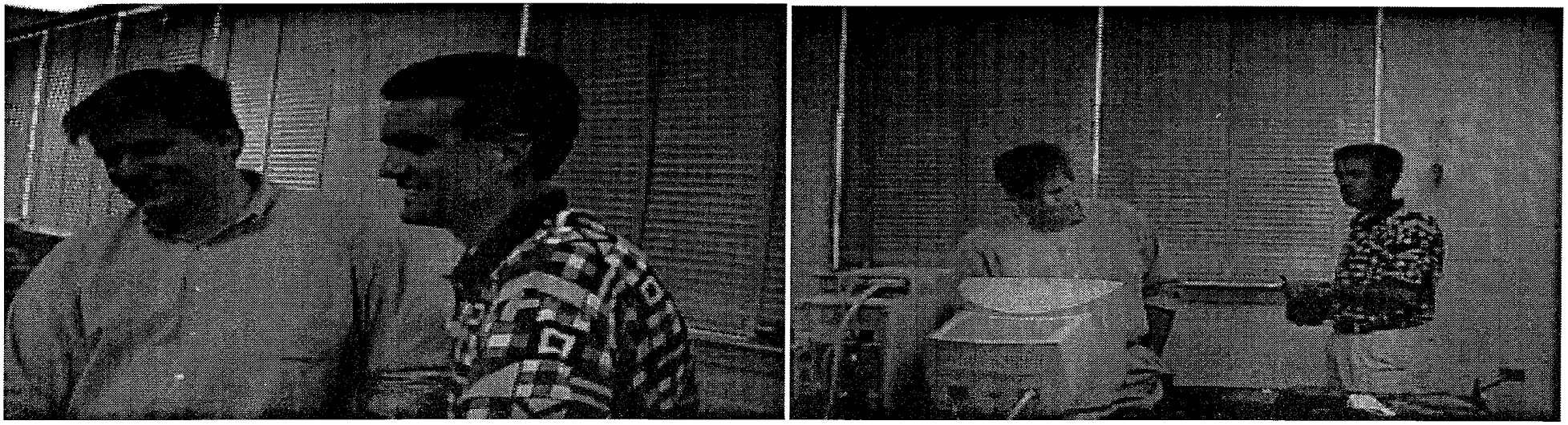
Friday we presented our weekly reports. Most teams were mainly preparing for their final report; however, everyone still managed to give decent reports.

Apple Computer, Inc.

On July 27, 1995, Doug Brooks and Jeff Lloyd, representatives from Apple Computer, Inc. came to talk to us about a new software that Apple has designed called QuickTime VR. This package was a spin off from Apple's previous software navigatable QuickTime. The QuickTime VR comes standard on the Macintosh 75 and it uses RISC (Reduced Instruction Set Code) based hardware and AV technology. This software can be used on any 32 MB Macintosh machine, but a 40MB machine is recommend. Apple's QuickTime VR gives the user a 3D vision of a surrounding area, allowing the user to tour the area with interactive control (i.e. look around you, zoom in and out, sometimes look up and down as if they were actually there. The software also allows the user to use the same surrounding area to display it as a movie in a small window as well as full screen digital video. Since this software is user friendly, the user can create his/her own movie. It may be a panoramic movie or an object movie. A panoramic movie is where you take several pictures on 35mm film or otherwise and load them into the computer via CD-ROM or a digital camera and each frame is "stitched" together by QuickTime VR. There must be at least a 30% overlap of the frames in order for the mechanism to work. The frames are "blended" together -- blend is a command in the script program that handles stitching errors. The script program is similar to the script programs in the shell of the UNIX system. In order to create a near perfect movie, the planning is the most vital part of the production. The more work planning the scene, the easier it is to create the movie. The things to keep in mind are the following: plan the scene, use multiple nodes (take picture in more than one location), decide carefully where to place the camera, where to take the pictures and most importantly the tripod must be level. An object movie is a set of pictures that is set to QuickTime to create the movie effect only using an object, such as a pumpkin figurine. The object is rotated so many degrees each time a picture is taken.



Douglass Brooks and Jeff Lloyd, Apple System Engineers exhibit QuickTime VR techniques to the Researchers 7-27-95



Travel-Siggraph

To: All Participants
From: Dr. Linda Hayden, Principal Investigator

RE: **Travel Arrangements for SIGGRAPH'95**

The following arrangements have been made for travel to the SIGGRAPH Conference in Los Angeles, California. Make arrangements to arrive at the Norfolk Airport by 1:30pm Saturday afternoon Aug. 5, 1995 and be picked up at 9:22pm on the following Thursday night, Aug 10,1995. I can be reached at (804) 485-0979 or (919) 335-3617 should you have questions about the arrangements. Wear your t-shirts for travel.

Departure: Sharon Saunders and Michelle Brown will organize the personal car pool. Extra cars can be left at Dr. Hayden's home. These directions are provided for those who need to park cars in Portsmouth: Drivers take route 17 to Deep Creek. Take Interstate 64 West (second on-ramp) to the first exit #297. Drive straight off the exit-ramp across Military Highway into Cavalier Industrial Park. You will be on Cavalier Blvd. Stay on Cavalier Bldv for 2 miles pass the railroad track into Cavalier Manor subdivision. Turn Left onto Roosevelt Blvd. Stop at 1318 Roosevelt. USAIR flight #230 depart Norfolk Airport at 2:20pm EST, changes to #1831 in Baltimore and arrives in Los Angeles at 6:56 pm PST.

Housing: Travellers will be housed at the Park Plaza Hotel (213) 384-528.1 The Park Plaza has a indoor swimming pool, a free continental breakfast, health club, sauna and free shuttle bus to all other conference hotels and the convention center where the conference will be held. It is located less than 2 miles from downtown LA and the SIGGRAPH Convention Center. Rooms will be paid for and any imposed taxes. Phone calls and in-room movies or other hotel cost are the responsibility of the individual travellers. Room confirmation numbers are #0663000546 through #0663000554 under the name of Linda Hayden, confirmed for late arrival. Pack casual clothes, swimwear & ECSU t-shirts

Return: Travellers are scheduled to leave Los Angeles Thursday Aug 10th on USAIR flight #1658 which departs LAX Airport at 11:20AM changing to #270 in Baltimore and arrives at Norfolk Airport at 9:22 pm. Please make your own arrangements from the airport to your home.

Meals: Travellers will be allowed a perdiem of $70.00 ($35 will be paid on Saturday and another $35 on Tuesday). The hotel will provide free continental breakfast. You will want to bring additional money for your personal expenses.

****
* * * Aug. 5-10, 1995 - SIGGRAPH CONFERENCE * * *
****

SIGGRAPH is the world's largest, most prestigious conference on computer graphics and interactive techniques. It is a powerful interactive media adventure. There studends will meet and exchange ideas with people who envision, explore, imagine and define the magic of real-time global collaborations. The exhibits will show all the leading suppliers of hardware, software and services that empower the digital revolution.We will attend the conference in August when science, digital media, human interaction, entertainment and networked environments converge to create SIGGRAPH95

Time will be allocated during the trip for students to visit the Disney-park or take the MGM studio tour. Students will spend at least half of each day at the SIGGRAPH conference. We will carry powerbook computers, modems and portable printers so that students can continue their research efforts and write required travel reports.

Programs & Events

Filmmakers, engineers, educators, and artists. Software developers and senior executives. Hardware designers, animators, and scientists. Venture capitalists and visionaries. Over 30,000 experts, explorers, and enthusiasts from all over the world. All focused on the adventurous edge of cyberspace, interactive digital techniques, new entertainment media, networked communities, and the fundamental science that creates tomorrow's technologies.

Register now for six challenging, fascinating, enlightening days at SIGGRAPH 95.

Courses

Instructional sessions on the latest topics, trends, and technologies in computer graphics and interactive techniques. Course offerings cover the full breadth and depth of the discipline, and range from basic introductions to exploration of leading-edge concepts. See pages 14-25 for course descriptions.

Courses Chair
WAYNE CARLSON
The Ohio State University

Sunday
6 August
1:30 pm – 5 pm

Monday and Tuesday
7 – 8 August
8:30 am – 5 pm

Papers

The world's most respected forum for intellectual exploration of computer graphics and interactive techniques. Developers and researchers identify, clarify, and redefine problems, and propose creative, often surprising, solutions. See pages 26-32 for papers presenters and topics.

Papers Chair
ROB COOK
Light Source, Inc.

Wednesday
9 August
10 am – 5:30 pm

Thursday and Friday
10 – 11 August
8:30 am – 5:30 pm

Technical Sketches

Informal presentations of research in progress followed by questions, answers, arguments, and new perspectives.

Technical Sketches Chair
ROB COOK
Light Source, Inc.

Wednesday – Friday
9 – 11 August
1:45 pm – 5:30 pm

Panels

New visions and unresolved issues. Emerging technologies and creative controversies. Ethical dilemmas. Provocative opinions. SIGGRAPH 95 Panels feature all this and more, as panelists engage each other and the audience in free-wheeling debates. See pages 26-32 for panels presenters and topics.

Panels Chair
LEO HOURVITZ
Alias

Wednesday
9 August
10 am – 5:30 pm

Thursday and Friday
10 – 11 August
8:30 am – 5:30 pm

Computer Animation Festival/Electronic Theatre

A major highlight of every SIGGRAPH conference: the year's best computer animation on film, video, and other electronic media. The Computer Animation Festival presents a broad array of works in several formats and categories in the Computer Animation Festival Screening Rooms (open free of charge to all conference attendees). A representative selection of Festival entries is shown in the evening Electronic Theatre, presented this year in LA's historic Shrine Auditorium. An Electronic Theatre ticket is included with Conference Passport, Papers/Panels Passport, and Courses Passport registrations. Educators' Passport and Exhibits Plus registrants must purchase Electronic Theatre tickets, based on availability, upon arrival at the Los Angeles Convention Center. On-site ticket sales begin Sunday, 6 August.

Computer Animation Festival/ Electronic Theatre Co-Chairs

FRANK FOSTER
Sony Pictures Imageworks

JOAN COLLINS
Cinergi Productions

Electronic Theatre
Monday
7 August
7 pm – 9 pm

Tuesday – Thursday
8 – 10 August
7:30 pm – 9:30 pm

Computer Animation Festival Screening Rooms
Sunday
6 August
5 pm – 7 pm

Monday – Tuesday
7 – 8 August
9 am – 7 pm

Wednesday – Thursday
9 – 10 August
9 am – 6 pm

Art Gallery

Exceptional aesthetic achievements showcased in the world's leading annual exhibit of computer art. 2D and 3D works, installations, interactive experiences, digital illustrations, artists' books, and postal art.

Art Gallery Chair
[illegible]
University of Oregon

Sunday
6 August
5 pm – 7 pm

Monday – Tuesday
7 – 8 August
9 am – 7 pm

Wednesday – Thursday
9 – 10 August
9 am – 6 pm

Friday
11 August
9 am – 1 pm

Artist/Designer Sketches

Presentations: creative and production issues, new applications of digital technologies, experimental projects, and works in progress.

Artist/Designer Sketches Chair
EDUARDO KAC
University of Kentucky

Wednesday
9 August
10 am – 11:45 am

Thursday – Friday
10 – 11 August
8:30 am – 12:15 pm

Interactive Communities

Social interactions are rapidly shaping the local, national, and global information infrastructure. The convergence of digital communications networks and computer graphics is opening up a new realm of virtual environments, visualization and multimedia experiences. In Interactive Communities, leading examples from art, science, medicine, defense, music, and education are presented at the Los Angeles Convention Center and, via high-performance networks, from locations around the LA Basin and worldwide. The SIGKids Production Lab features the state of the art in young people's digital media production efforts.

Interactive Communities Co-Chairs

COCO CONN
Digital Circus Productions

ANDY GOODRICH
Parallax Graphics

ROB HENNIGAR
Art Center College of Design

Sunday
6 August
5 pm – 7 pm

Monday – Tuesday
7 – 8 August
9 am – 7 pm

Wednesday – Thursday
9 – 10 August
9 am – 6 pm

Friday
11 August
9 am – 1 pm

Programs and Events

Interactive Entertainment
This new program, inspired by the convergence of Hollywood and Silicon Valley, features outstanding examples of interactivity in location-based entertainment, television, on-line entertainment services, and electronic games. Some Interactive Entertainment displays also take attendees behind the scenes to demonstrate how specific projects were produced and how future projects might be conceived.

Interactive Entertainment Chair
ISAAC VICTOR KERLOW
Pratt Institute

Sunday
6 August
5 pm – 7 pm

Monday – Tuesday
7 – 8 August
9 am – 7 pm

Wednesday – Thursday
9 – 10 August
9 am – 6 pm

Friday
11 August
9 am – 1 pm

Educators' Program
Sessions on using and teaching computer graphics and interactive techniques at all educational levels, from pre-school through university.

Educators' Program Chair
STEPHAN R. KEITH
Sterling Software

Friday
11 August
9 am – 5 pm

General Sessions
Open to all SIGGRAPH 95 attendees.

Behind the Scenes: Computer Graphics in Film
Some of Hollywood's most adventurous artists reveal how they use computers to create spectacular special effects. Inside information illustrated with recent examples from current films.

Organizer
CAROLYN WILLIAMS
Williams/Keeser

Tuesday – Wednesday
8 – 9 August
12:15 pm – 1:30 pm

Ask Dr. SIGGRAPH
How do they really make 30 frames/second video from 24 frames/second film? What is the sound of one ray tracing? If a tree is rendered in a forest, and there is no light source, does it cast a shadow? If you have ever pondered such important issues, why not ask our expert panel? After all, "they know more than you." Questions for our Graphics Jims can be submitted through the World Wide Web kiosks at the Los Angeles Convention Center, or in advance (so that a more penetrating answer may be prepared) to:

dr_siggraph@siggraph.org

Jims
JIM BLINN
J. LOREN CARPENTER
A.J. GLASSNER
JIM "JIM" KAJIYA
SALLY J. ROSENTHAL

Friday
11 August
12:15 pm – 1:30 pm

Keynote Address/Awards
SIGGRAPH 95's featured speaker followed by two awards:

The 1995 Computer Graphics Achievement Award
Annual Award for significant recent contributions in computer graphics.

The 1995 Steven A. Coons Award
Biannually presented to an individual whose work has had long-term creative impact on the computer graphics field.

Wednesday
9 August
8 am – 9:30 am

Receptions
Mingle, chat, eat, and drink with a fascinating and diverse group of people: industry leaders, software pioneers, hardware visionaries, academic theorists, and inspired artists.

Fundamentals Seminar
An essential, accessible introduction to computer graphics jargon, concepts, techniques, and technologies. The perfect orientation for novices on the fast track. Open to all SIGGRAPH 95 attendees.

Organizers
DINO SCHWEITZER
United States Air Force Academy

G. SCOTT OWEN
Georgia State University

Sunday
6 August
2 pm – 5 pm

SIGs
Special Interest Groups for attendees who think and work in similar technologies and environments. Topics, times, and locations for SIGs scheduled by Tuesday, 13 June are posted in the conference registration area and listed in the SIGGRAPH 95 Program and Buyer's Guide. To schedule a SIG, call:

+1.312.321.6830

or send email to:
sigs@siggraph.org

Birds of a Feather
Impromptu gatherings may be organized by anyone who posts a notice on the Birds of a Feather sign-up board in the conference registration area.

T-shirt Contest
The winners of the annual SIGGRAPH t-shirt contest will be announced at the Papers/Panels reception on Thursday, 10 August. Prizes will be awarded.

For entry information, contact:
Jock Mackinlay
Xerox PARC
+1.415.812.4777 fax
mackinlay.parc@xerox.com

GraphicsNet
SIGGRAPH 95's state-of-the-art, gigabit-per-second fiber infrastructure linked with worldwide nets to create a global, interactive computer graphics workspace. With GraphicsNet, attendees and exhibitors interact and collaborate throughout the conference, the continent, and the globe to experience the future of networked graphics environments.

International Center

In the International Center, the temporary headquarters of the worldwide computer graphics community, members of the SIGGRAPH 95 International Operations Committee and staff offer translation assistance and answers to conference questions. Multilingual student volunteers provide simultaneous translation and conference information. Look for their yellow vests with flags that indicate their language fluency.

[illegible] SIGGRAPH 95[illegible]

Miembros del Comité de Operaciones Internacionales multilingues estan a su disposicion para responder dudas y proveer información sobre SIGGRAPH 95

SIGGRAPH 95에 관한 정보 제공 및 질문 답변을 위한 복수 언어를 구사하는 국제 운영위원회 위원을 배치하였습니다.

マルチリンガルな国際運営委員会のメンバーが外国語による SIGGRAPH 95 に関するご質問や情報提供に対応致します。

Mitglieder des mehrsprachigen Internationalen Organisationskomitees stehen bereit, um Fragen zu beantworten und über die SIGGRAPH 95 zu informieren.

Les membres polyglottes de notre Comité des Opérations Internationales restent à votre disposition pour répondre à vos questions et pour vous fournir toutes informations complémentaires sur le SIGGRAPH 95.

International Operations Committee
If you need additional information about SIGGRAPH 95, please contact any of the following members of the International Operations Committee.

Chair
Midori Kitagawa De Leon
(Japanese and English)
The Advanced Computing Center for Arts and Design
The Ohio State University
1224 Kinnear Road
Columbus, Ohio 43212 USA
+1.614.292.3416
+1.614.292.7776 fax
intl.s95@siggraph.org

Coordinator
Jean Ippolito (Japanese)
Savannah College of Art and Design
P.O. Box 3146
Savannah, Georgia 31402 USA
+1.912.231.2372
+1.912.238.2428 fax
intl.s95@siggraph.org

Igor S. Alexandrov (Russian)
13/3 Sadovaya Chernogriazskaya Street
Apartment 158
Moscow 103064 RUSSIA
+7.095.208.4529
+7.095.128.1854 fax
igorsa@glas.apc.org

Len Breen (English)
31 Old Gloucester Street
Bloomsbury
London WC1N 3AF UNITED KINGDOM
+44.71.242.0551
+44.71.831.9377 fax
len@mdx.ac.uk

Paul Brown (English)
Information Services Division
Griffith University
Queensland 4111 AUSTRALIA
+61.7.875.5286
+61.7.844.1486 fax
p.brown@ins.gu.edu.au

Felipe Gonzalez Carrasco (Spanish)
Playa Pichilingue #144
Colonia Reforma Iztaccihuatl
Mexico D.F. 08840 MEXICO
+52.5.6529566, ext. 210
+52.5.6523176 fax
felipeca@spin.com.mx

Thierry Frey (French)
1, rue Denis Lazard
83000 Toulon, FRANCE
+33.94.02.15.60
+33.94.24.50.50 fax
frey@amol.eerie.fr

Masa Inakage (Japanese)
Media Studio
2-24-7 Shichirigahama-Higashi
Kamakura, Kanagawa 248 JAPAN
+81.467.32.7941
+81.467.32.7943 fax
inakage@mediastudio.co.jp

Myeong Won Lee (Korean)
Software Research Laboratories
Korea Telecom
17 Umyon-dong, Socho-gu
Seoul 137-792 KOREA
+82.2.526.6567
+82.2.526.5909 fax
mwlee@pino.kotel.co.kr

Maria Grazia Mattei (Italian)
Via Rimembranze di Lambrate 31
20134 Milano, ITALY
+39.2.2640062 phone and fax
maria.grazia.mattei@galactica.it

Joachim Rix (German)
Fraunhofer-Institut für Graphische Datenverarbeitung
Wilhelminenstrasse 7
D-64283 Darmstadt, GERMANY
+49.6151.155.220
+49.6151.155.299 fax
rix@igd.fhg.de

Hung-Chuan Teh (Mandarin)
Department of Information Systems and Computer Science
National University of Singapore
Lower Kent Ridge Road
Singapore 0511 SINGAPORE
+65.772.2912
+65.779.4580 fax
tehhc@iscs.nus.sg

Wim van der Plas (Dutch)
POB 8656 3009 AR
Rotterdam, THE NETHERLANDS
+31.10.4778605 phone and fax
isea@mbr.frg.eur.nl

Steve Shi-Nine Yang (Mandarin)
Department of Computer Science
National Tsing Hua University
Hsin-Chu, TAIWAN 300
+886.35.731074
+886.35.723694 fax
snyang@cs.nthu.edu.tw

Marcelo Knorich Zuffo (Portuguese)
Av. Prof. Luciano Gualberto, 158 Trav.3
Sao Paulo - SP, 05508-900 BRAZIL
+55.11.818.5254
+55.11.211.4574 fax
mkzuffo@lsi.usp.br

DEPARTMENT OF THE NAVY
NAVY RECRUITING DISTRICT RICHMOND
3410 WEST BROAD STREET
RICHMOND, VIRGINIA 23230-5004

July 21, 1995

Dear Dr. Hayden,

The following arrangements have been made for the Navy's July 31-August 3, 1995, Educator Orientation Visit to the Naval Air Station, Pensacola, Florida. Flight departure times are still subject to change. Please call me on Friday, 28 July to obtain the latest departure information; additionally, I will keep my answering tape (commercial number) updated during the weekend.

Departure. The following is the projected (requested) flight arrangements:

* West Virginia and Roanoke area participants arrive Charleston airport 9:15 a.m.; departure approximately 10:00 a.m.
** Richmond area participants arrive Richmond International, Executive Terminal 10:15; departure approximately 11:00 a.m.
*** Tidewater area participants arrive either NAS Norfolk or NAS Oceana (specifics being worked out) 10:45; departure approximately 11:30 a.m.

Once we receive the flight advisory "we" (the recruiters and myself) will proceed with confirming your travel arrangements to one of the three locations. Please be advised, these times could still change, as late as Monday morning, (flexibility counts!) due to operational commitments. Feel free to contact me (I have arranged my schedule to be at the district on the 28th) or the recruiting station that will be coordinating your transportation.

Lodging. We will be staying at the Bayshores Bachelor Officers Quarters. All guests have been pre-registered and each of you have single accommodations. When we arrive in Pensacola, we will be met by representatives from the Navy Public Affairs Office and transported to the BOQ. There we'll obtain room keys and have time to get settled in before a "Welcome Aboard" fish fry that evening.

Clothing. Shorts and/or slacks are appropriate attire for the tour activities. Gentlemen may want to bring a dress shirt and tie (jackets not required) and ladies a dress or pantsuit for the banquet on Wednesday evening. Be sure to bring comfortable walking shoes and sun glasses. We have planned the itinerary to take into account Florida's summer weather and to allow some free time in the afternoons (all official tour activities should end by 3:00 p.m. each day).

Schedule. Attached is a copy of our itinerary and a listing of participants.

We look forward to having you join us on our EOV to Pensacola. If you have any questions, please call me or your local Navy Recruiting Station.

Sincerely,

Judy M. Baber

JUDY M. BABER
Education Specialist

Enclosures

DEPARTMENT OF THE NAVY
NAVY RECRUITING DISTRICT, RICHMOND
3410 WEST BROAD STREET
RICHMOND, VA 23230-5004

June 23, 1995

Dr. Linda B. Hayden
1318 Roosevelt Boulevard
Elizabthe City, NC 27909

Dear Linda,

Thank you for your interest in Navy Recruiting District Richmond's Educator Orientation Visit (EOV) to Pensacola on 31 July through 3 August 1995. As the Commanding Officer of NRD Richmond, I look forward to the opportunity to meet with you and provide you a first-hand look at the many training and educational opportunities available to young men and women in today's Navy.

Our itinerary has been planned to include a mixture of "hands-on" activities and demonstrations, plus briefings coupled with social activities and free-time to allow you to enjoy the Naval Air Station and surrounding Pensacola area. Dress for the EOV will be informal with the exception of the banquet planned in your honor on Wednesday evening.

Transportation to Pensacola will be provided by a Navy DC-9 jet. Information on the departure times on the 31st and the return trip will be provided at a later time. As noted on your reservation form, the use of Navy transportation provides you with a first hand look at jobs and skills in Naval aviation. However, because the aircraft used has a primary mission of transporting Naval personnel and materials to meet operational commitments, EOV flights are occasionally affected by unexpected Navy airlift requirements having higher priority. Although this occurs infrequently, there have been occasions when return flights have been affected. If this occurs, the Navy will quickly return you home using commercial transportation.

The EOV is being filled as registration forms and/or deposit checks are received, with priority being given to those who have not participated in a Navy EOV within the past 5 years. This letter serves as your official invitation and a confirmation that space is being held for you.

You will be receiving additional information prior to departure. If you have any questions or if your plans change, please contact my Education Specialist, Judy Baber at (804) 353-6025 or toll-free at 1-800-552-9950.

Sincerely,

J. D. CAMACHO
Commander
U.S. Navy
Commanding Officer

Appendix and Signature Sheets

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

IN REPLY REFER TO
Ser 353/032VPF

Dr. Jimmy R. Jenkins
Chancellor
Elizabeth City State University
1704 Weeksville Road
Elizabeth City, NC 27909

Dear Dr. Jenkins:

It is my pleasure to inform you that the proposal entitled "ECSU Instrumentation for Educational Use" submitted to the Office of Naval Research by Dr. Linda Hayden of your Department of Mathematics and Computer Science has been recommended for funding in the amount of $297,090. These funds will be used to acquire instrumentation for educational activities.

Dr. Hayden's proposal was submitted in response to the Department of Defense Broad Agency Announcement "Infrastructure Support Program for Historically Black Colleges/Universities and Minority Institutions (HBCU/MI) FY 94-FY 95." The Office of Naval Research and the Advanced Research Projects Agency jointly provided funding for the instrumentation component of this program. The objectives of this component are to provide instrumentation to enhance the capability of the institution to conduct research and/or to attract, educate, and retain underrepresented minorities in science, engineering, and mathematics.

Dr. Hayden's proposal was one of 29 selected for funding from a very competitive group of proposals. It emerged successfully because of the strengths of the proposed program and the commitment by university administrators to the program objectives.

My congratulations to your administration and to Dr. Hayden. I look forward to a productive relationship as Elizabeth City State University and the Office of Naval Research pursue objectives of mutual interest.

Sincerely,

MARC PELAEZ
Rear Admiral, USN
Chief of Naval Research

cc: Dr. Linda Hayden

BLACK ISSUES IN HIGHER EDUCATION™

MAY 19, 1994 VOL. 11, NO. 6

$ 2.50

Success is in the Numbers

American University's Mathematics Ph.D. Candidates

3RD ANNUAL SPECIAL REPORT

TOP 100

DEGREE PRODUCERS

American University:

Success is in The Numbers

African American Women Excel in Math Ph.D. Program

by Kathleen Kennedy Manzo

WASHINGTON, DC — It doesn't take a mathematician or even an adding machine to calculate the numbers. In just a few seconds, using 10 fingers and a couple of toes, it can be shown that the African American women in the entire country who received doctorates in mathematics, between 1986 and 1991 number an even dozen.

In a field still dominated by white males, they represent less than 2 percent of doctoral recipients.

So when four Black women earned Ph.D.s in mathematics from American University (AU) in a two-year period, it was no small accomplishment. They represented a third of those who had done so nationwide during the six-year span. A fifth student at the Washington, DC, institution earned a doctorate in education administration, with a concentration in teaching mathematics.

By comparison, 1,887 white men, 470 white women and 27 Black men earned doctorates in mathematics during that same period, according to *Professional Women and Minorities*, a 1992 report by the Commission on Professions in Science and Technology. Howard University, the only historically Black institution with a doctoral program in the discipline, awarded two Ph.D.s in mathematics to women between 1986 and 1993.

Five more women of color are close to completing their coursework at AU, making the program the most successful in the nation with regard to minority women.

"We give people personal attention. We look at their background to see where they should start, so that if they need to, they can go back and finish some of the background courses," said Dr. Mary Gray, former chair of the math and statistics department who has led efforts to attract more women and minorities to the program since joining the faculty in 1968.

"The second thing we do is spend a lot of time worrying about other kinds of support...we have a safety net," she said.

A Safety Net

The safety net — which students and graduates said is a critical factor in their persistence — includes accommodating the busy professional and personal lives of the women, many of whom are working mothers.

Gray has paired single mothers to help them save money on child care and housing. The department, at Gray's urging,

established a loan fund to help cover the cost of books. And the university approved several paid instructorship positions for those students who do not hold outside jobs during their course of study, but have outstanding teaching records.

The first step, however, is recruitment. Gray speaks to women at high schools, historically Black institutions and women's colleges throughout the country each year about the benefits of earning a mathematics degree. She relies on former students to recommend their colleagues for the program. She also works closely with HBCUs to identify talented math students with the potential for earning a higher degree.

All of these factors have both attracted talented mathematicians to the school and encouraged them to stick with the rigorous program. Most finish within five years, less than the national average, according to Gray.

"Trying to attract women or minority students to math by pretending it's easy is a big mistake, because it isn't easy for most people," Gray said. "So what you need to do is convince women that they can do it, and that it's worth putting the time and effort in."

Dr. Linda Hayden was one of those convinced she could achieve her dream of a Ph.D. in mathematics. As a member of the math faculty at Elizabeth City University in North Carolina, Hayden knew that a terminal degree was a necessity for her to continue teaching at the college level. She took a four-year sabbatical to work on her doctorate full time and earned her Ph.D. in 1989.

"Mary Gray was a very good role model. I call her my role model for life, my advisor for life," said Hayden, who now works with graduate students at Elizabeth City, and, like Gray, encourages them to pursue doctorates. Hayden has recommended two students to the AU program.

PHOTO BY: BENJAMIN RUSNAK

"Trying to attract women or minority students to math by pretending it's easy is a big mistake, because it isn't easy for most people. So what you need to do is convince women that they can do it and that it's worth putting the time and effort in."

— Dr. Mary Gray

FORMER CHAIRWOMAN, DEPARTMENT OF MATHEMATICS AND STATISTICS
AMERICAN UNIVERSITY

Current students said the personal advising, and a strong sense that advisors want them to succeed, have kept them on a steady course throughout their studies. Joyce Higginbotham, a math teacher at Alice Deal Junior High School in the District of Columbia, had given up plans for an advanced degree after a divorce left her financially strapped. She received funding through the Department of Education's Patricia Roberts Harris Fellowship Program — which provides tuition costs for up to three African American women annually — and has attended classes while continuing to work.

Persistence, Strength Required

"A doctoral program is never easy, and getting a Ph.D. while working full time is suicidal," Higginbotham said. "In general, the culture and the philosophy of the department is one that will reach out and encourage students. Once, when I was going through a difficult period, I told my advisor that I would drop out, and she told me that wasn't to be discussed again. She threw that [thought] out the window with force."

Peggy Winfield, who is entering the dissertation stage, also remembers the times she was ready to quit. Although she earned a bachelor's degree in math, she chose to get her master's in communication. That decision put her somewhat behind when she chose to pursue her doctorate in math.

"I've stayed here by the support of teachers who put up with me....They want me to enter into the field of mathematics, without a doubt," Winfield said.

Linda Lewis, who teaches math at the University of the District of Columbia, said the program's emphasis on teaching has translated into big benefits in her own classroom. Balancing the roles of student and teacher, however, have left her with virtually no free time.

Dr. Martha Brown worked as an administrator in Prince George's County Public Schools in Maryland while attending the program part time. The process was painful and grueling, but the encour-

See Math, pg. 42, col. 2

Ph.D. Candidates in mathematics (l to r): Linda Lewis, Joyce Higginbotham, Cecile Kahan and Peggy Winfield.

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—Joyce Higginbotham
DOCTORAL STUDENT

Math, *from pg. 41, col. 3*

agement of some faculty members, and support of fellow students, helped her complete the degree in 1989.

"Linda Hayden was my rock. There were times when I was her rock. We supported each other," Brown said. But desire is not enough for any student to sustain the level of intensity, commitment and concentration necessary to develop the sophistication and understanding of mathematics required for advanced study.

"Only the most talented women can succeed. If you don't come with something, you're not going to get anything," Brown said. "These are all strong women. You can't get up there if you are weak, they [faculty and other students] will eat you alive and spit you out. You really have to have a sense of who you are; you have to have some backbone."

Early Ambitions

Like many of the students, Brown's determination to excel in mathematics started as a child and was nurtured by teachers as early as elementary school. She attended a segregated school in Indianapolis where teachers motivated all students to learn math and science. Today, as supervisor of mathematics in Prince George's County, Brown works with elementary school teachers to ease their discomfort with math. She urges them to see the potential in all students, and combat any stereotypes about their students' abilities in the subject.

"I have a particularly keen interest in [young women] who opt to enter elementary educationand do so because they want to avoid the mathematics...that's not a good reason. We need strong math teachers in elementary education," Brown said.

Cecile Kahan, a mathematics teacher coordinator at Suitland High School, also in Prince George's, remembers setting her goal for earning a doctorate early in life.

"Mine was a burning desire from the time I was a kid...to one day obtain a Ph.D. It just happens that my interest was in mathematics," said Kahan. "When I was growing up [in New Orleans] and going to school, you always had to be better than the best, and you always had to aim high."

Winfield knew all through high school that she wanted to be a mathematician. She attended an all-girl high school in Baltimore, where she was tracked through a rigorous schedule of advanced math courses. For her, the lack of women, and in particular Black women, in the field is telling of the general low numbers of students who are drawn to the discipline. According to her research, the first Black woman to earn a doctorate in the field was Evelyn Glanville, who graduated from Yale University in 1949.

"We're not talking 50 years of my people competing in mathematics [at the top academic levels], so I feel privileged to be among the small few. You don't find many people in math, period. Math is not easy. Math is painful, and those who succeed are those who persevere," Winfield said.

"When I actually learned about the Black women who were before me...it made me grateful to have the support, it made me mad that other people didn't have that support."

Measures of Success

This support has not made the program any less rigorous, insists Gray. Black women graduates have met the department's high standards, have completed and published outstanding dissertations, and have been awarded grants for their research and innovative programs.

"They all said that they were pushed very hard, occasionally to their irritation," Gray said. "All their work has been published. That's the academic community's way of saying whether it is good enough.... They have been able to follow the usual academic measures of success."

Hayden recently received a $1.2 million grant from the Office of Naval Research to supplement the graduate program at Elizabeth City. Dr. Joan Sterling Langdon, an associate professor of computer science at Bowie State University, who earned her doctorate in 1989, has directed student training programs at NASA's Goddard Space Flight Center.

Dr. Ann Taylor, dean of faculty at Bethune-Cookman College, who earned her education administration degree in 1988, is a candidate for several top administrative posts, Gray said.

Dr. Elaine Smith, a 1988 graduate, teaches math at Washington, DC's Wilson High School, where she directs The Math Center, an after-school tutoring program.

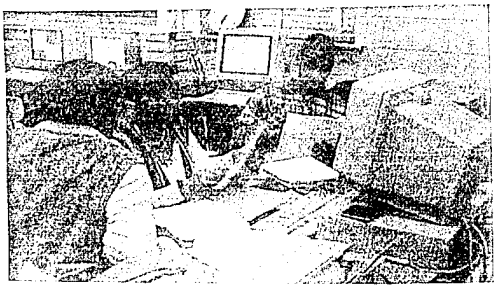
Officials from other four-year institutions have approached Gray to find out how to boost the number of women and minorities in their math programs, but they usually do not follow through on her suggestions, she said.

The federal budget recently approved by Congress discontinues funding of the Patricia Roberts Harris fellowships, thereby leaving Gray scrambling for alternate funding. Maintaining the financial incentives, as well as professional and emotional support are crucial if the persistence of minority women in mathematics is to continue.

"I know that a lot of African Americans love mathematics. [The low number of Black women] definitely says to me that there is not the commitment to recruit them. There is a big leak in the pipeline," said Hayden. ■

ECSU

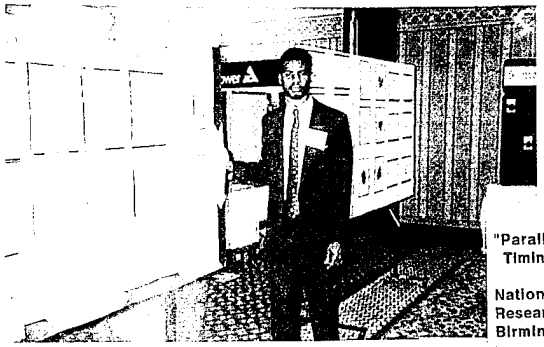
Dr. Hayden & [illegible]



Fractals
&
Chaos

ATM Networking Research Team

Sharon Saunders



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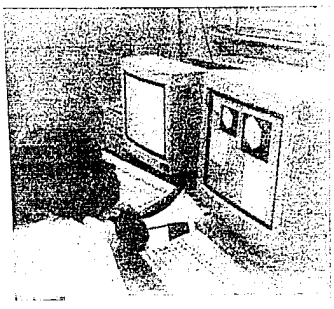

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Nurturing ECSU Research Talent Program - Office of Naval Research

Dr. Linda Bailey Hayden, Principal Investigator

Box 672 ECSU Elizabeth City, NC 27909

(919)335-3617 LHAYDEN@SUN1.ECSU.EDU

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